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RAIL AND MOTOR OUTLOADING CAPABILITY STUDY. FORT DEVENS, MASSAC--ETC(U)
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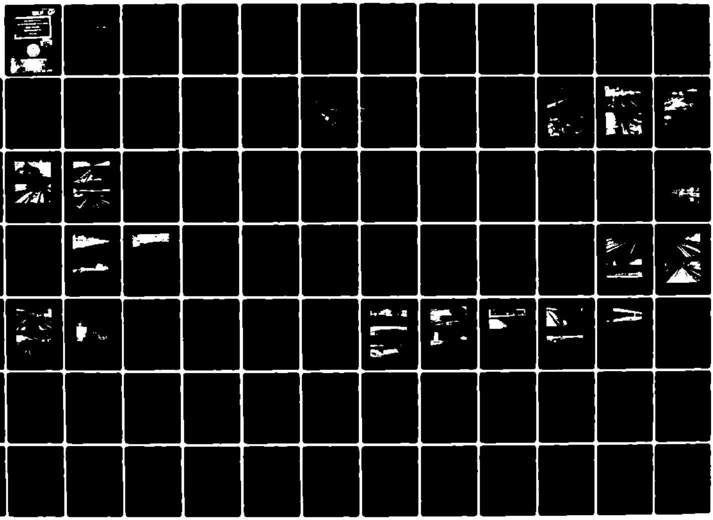

MTMC REPORT TE 79-4-54

RAIL AND MOTOR OUTLOADING CAPABILITY STUDY

FORT DEVENS, MASSACHUSETTS

March 1980

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MILITARY TRAFFIC MANAGEMENT COMMAND

TRANSPORTATION ENGINEERING AGENCY

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EXECUTIVE SUMMARY

1. SCOPE

The Military Traffic Management Command (MTMC) surveyed the rail and motor facilities of Fort Devens, Massachusetts, in June 1979, to determine the installation's outloading capability. Commercial rail facilities within a 25-mile radius of Fort Devens were included in the survey.

2. FINDINGS

The primary finding is that Fort Devens does not have the capability to support a rail operation.

The equipment outloading operation from Fort Devens would include six battalions, plus some smaller units. To transport these units by rail would require 1,879 railcars[1/], consisting of 1,819 57-foot flatcars, three 80-ton flatcars, and 57 boxcars. These units could be outloaded in 10 days using Plan 4 (176 railcars per day for the first 3 days, then 193 railcars per day for the following 7 days), provided the rail system is rehabilitated.

The nonroadable equipment, which would require 101 flatcars and 57 boxcars, could be outloaded in less than 3 days. Other smaller units outloading prior to or after the peak outloading period impose no additional constraint on the system.

Fort Devens has approximately 4.23 miles (includes the National Guard (NG) area) of trackage. Most of this trackage, as well as the intersection crossings, is in poor condition (below Federal Railway Administration Class 2 safety standards), and to upgrade to Class 2 would cost approximately $413,000. In addition, the Boston and Maine Railroad (BM) tracks leading into the post areas are rated less than Class 1. The BM Fort Devens marshalling yard traverses the installation, providing easy access to trackage suitable for supporting the Fort Devens equipment outloading operation. However, nonroadable

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1/ Since most flatcars are 57 feet long (coupler-to-coupler), that length is used in this report; to convert to any other length, simply multiply the number of cars by 57 and divide by the desired length.

equipment (tracked or without wheels) would have to be loaded and secured onto trucks and then driven to the BM yard to be loaded and secured onto railcars.

Railheads within a 25-mile radius of Fort Devens are unsuitable for military operations because their spurs, or sidings, are too short, inaccessible, or located in residential or congested commercial areas.

On-post warehousing, loading docks, and side- and end-loading ramps are adequate and sufficient in number to accommodate the outloading quota by motor or rail.

The motor mode[2/] is the most feasible one for outloading contingency equipment from Fort Devens for distances of 800 miles or less. The 3, 722 roadable vehicles can be driven directly to the POE, while 197 commercial trucks are required to outload the rest of the post equipment.

Motor outloading versus rail outloading is a consideration at Fort Devens for the following reasons:

a. The motor outloading facilities are good.

b. Fort Devens is located within 800 miles of major east coast ports of embarkation.

c. The amount of nonroadable equipment to be moved is small.

d. A large number of commercial motor haulers are in the area.

e. The cost to rehabilitate the deteriorated rail facilities and the street-rail intersections is prohibitive when compared with the outloading requirement.

Table 1 shows the current and potential outloading capabilities (both rail and motor) of Fort Devens.

2/ Motor mode--Roadable vehicles are driven to the designated port of embarkation, while nonroadable vehicles are transported by commercial trucks.

TABLE 1
RAIL AND MOTOR OUTLOADING CAPABILITY

Rail

Rate	Number and Type of Railcars (57-ft Coupler-to-Coupler)				Current Constraints
	Flatcars	Gondolas	Boxcars	Total Outloading	
Daily Current	8	0	3	11	Trackage is below FRA Class 2 safety standard. Lack of blocking and bracing materials, small handtools, and bridgeplates.
Daily Mobilize	182	0	6	188	Same
Boston & Maine RR marshalling yard, located at Fort Devens (not Government owned)[a]	182 (Includes 3 80-ton flatcars)	0	6	188	Four portable timber end-loading ramps are required at a total cost of approx $10,000. Gravel track crossovers will have to be constructed, $1,000. A stock of blocking and bracing material, bridgeplates, small handtools, portable powersaws, cable, and cable-tensioning devices.
Plan 4 (for first 3 days)	157 (Includes 3 80-ton flatcars)	0	19	176	Same, plus requirement for 2 portable timber end ramps, repair 13 concrete or asphalt crossings, repair 2 timber-constructed crossings, repair asphalt end ramp, and rehabilitate and realign all trackage to FRA Class 2 safety standard, estimated cost $413,000.
Plan 4 (for final 7 days)	193	0	0	193	

Motor

Rate	Number and Type of Trailers			Current Constraints
	Flats	Vans	Total Outloading	
Daily Current:				
Concurrent (with rail operation)	5	3	8	
Separate (without rail operation)	9	13	21	
Daily Mobilize:				
Concurrent (with rail operation)	210[b]	128[b]	338	Availability of forklifts is limited to handle volume van-semitrailer outloading operation. Lack of blocking and bracing materials, small handtools, and trained blocking and bracing crews.
Separate (without rail operation)	400[c]	208[c]	608	
Organic Roadable Vehicles[d]	**Flats**	**Vans**	**Heavy Haulers**	
3,722	111	20	66	Same as above

[a] Recommended plan for ports of embarkation more than 800 miles distant.
[b] With existing available forklifts not used with rail operations.
[c] Using a/ above plus 6 additional end ramps with 19 positions.
[d] Recommended plan for ports of embarkation within 800 miles.

3. CONCLUSIONS

a. The post trackage lacks ballast, is poorly drained, and is more than 50 percent deteriorated. The lack of tie plates and the insufficient ballast under, around, and in the crib area of the crossties have caused increased stresses, resulting in split rails and ties, as well as poor track gauge.

b. Track 2, serving General Warehouse 1400, has 57-pound rail, which is light for today's boxcar loads. The BM lead tracks to the post west and east areas are below FRA Class 1. Also, the track in the east area has two curves above the recommended minimum of 12 degrees, which cause frequent derailment.

c. The face of the asphalt end-loading ramp at track 4 has deteriorated.

d. Two portable timber end ramps are required to load equipment on the tank track and track 2.

e. The BM Fort Devens marshalling yard is the only suitable outloading railhead. The other nearby commercial railheads cannot accommodate a military outloading operation.

f. Motor and rail outloading is constrained by a lack of blocking and bracing materials, small handtools, bridgeplates, trained blocking and bracing crews, and outloading plans, as well as by a shortage of materials handling equipment (MHE).

g. Using onsite end- and side-loading ramps, warehouse side-loading docks, and cranes and forklifts, the installation could outload 111 40-foot flatbed trucks in 2.8 hours, 66 heavy-hauler flats in 2.8 hours, and 20 40-foot vans in 1.0 hour.

4. RECOMMENDATIONS

a. For ports of embarkation within 800 miles, employ a motor outloading operation.

(1) Acquire a stock of blocking and bracing materials and small handtools, including portable powersaws and cable-tensioning devices.

(2) Provide advance training for blocking and bracing crews.

b. For ports of embarkation farther away than 800 miles, employ an all-rail move.

(1) Use the Boston and Maine Railroad marshalling yard located at Fort Devens as a railhead. This will require four portable timber end-loading ramps at a total cost of approximately $10, 000.

(2) Acquire a stock of blocking and bracing material; bridgeplates; and small handtools, including portable powersaws and cable-tensioning devices.

(3) Provide advance training for blocking and bracing crews.

(4) Provide warehousing for the blocking and bracing supplies.

I. INTRODUCTION

An onsite rail and motor outloading study of Fort Devens, Massachusetts (fig 1), was conducted by the Military Traffic Management Command Transportation Engineering Agency, Newport News, Virginia, from 18 through 22 June 1979. The principal objective of this study was to determine the capability of Fort Devens to support the deployment of units during a contingency environment. Another objective was to identify any physical improvements, as well as any suitable commercial rail facilities near Fort Devens, that could significantly increase the current outloading capability.

At present, Fort Devens rail outloading capability is limited because of the deteriorated condition of the installation trackage and the BM lead tracks that provide access to the installation's east and west sectors. The required outloading trackage is below Federal Railway Administration (FRA) Class 2 safety standards.

Although there are adequate side-loading ramps, side docks, and storage warehousing, two additional end-loading ramps, as well as additional forklifts, will be required. In addition, the post has no outloading plans, blocking and bracing materials, bridgeplates, portable powersaws, small handtools, cable-tensioning devices, and adequately trained blocking and bracing crews.

This study shows that, if these deficiencies were corrected, the rail facilities could support Plan 4, which consists of outloading 176 railcars (including the boxcar requirement) in 3 days and 193 railcars (including 36 additional flatcars) per day for 7 days.

This study considers other options that could produce 57, 100, and 148, railcar loads of roadable and nonroadable equipment and 70 railcar loads of nonroadable equipment per 24-hour period.

There are adequate commercial trackage and staging areas at the BM Fort Devens marshalling yard that could be used for a rail outloading operation.

Motor is the primary outloading mode to consider for Fort Devens, as the installation is located within 800 miles of major east coast ports of embarkation. There is no additional outloading facility cost required in order to conduct a motor move. For ports of embarkation farther than 800 miles, an all-rail move could be mounted from Fort Devens (cost approximately $413,000), or from the BM Fort Devens marshalling yard at a cost of approximately $10,000, for portable, timber end-loading ramps.

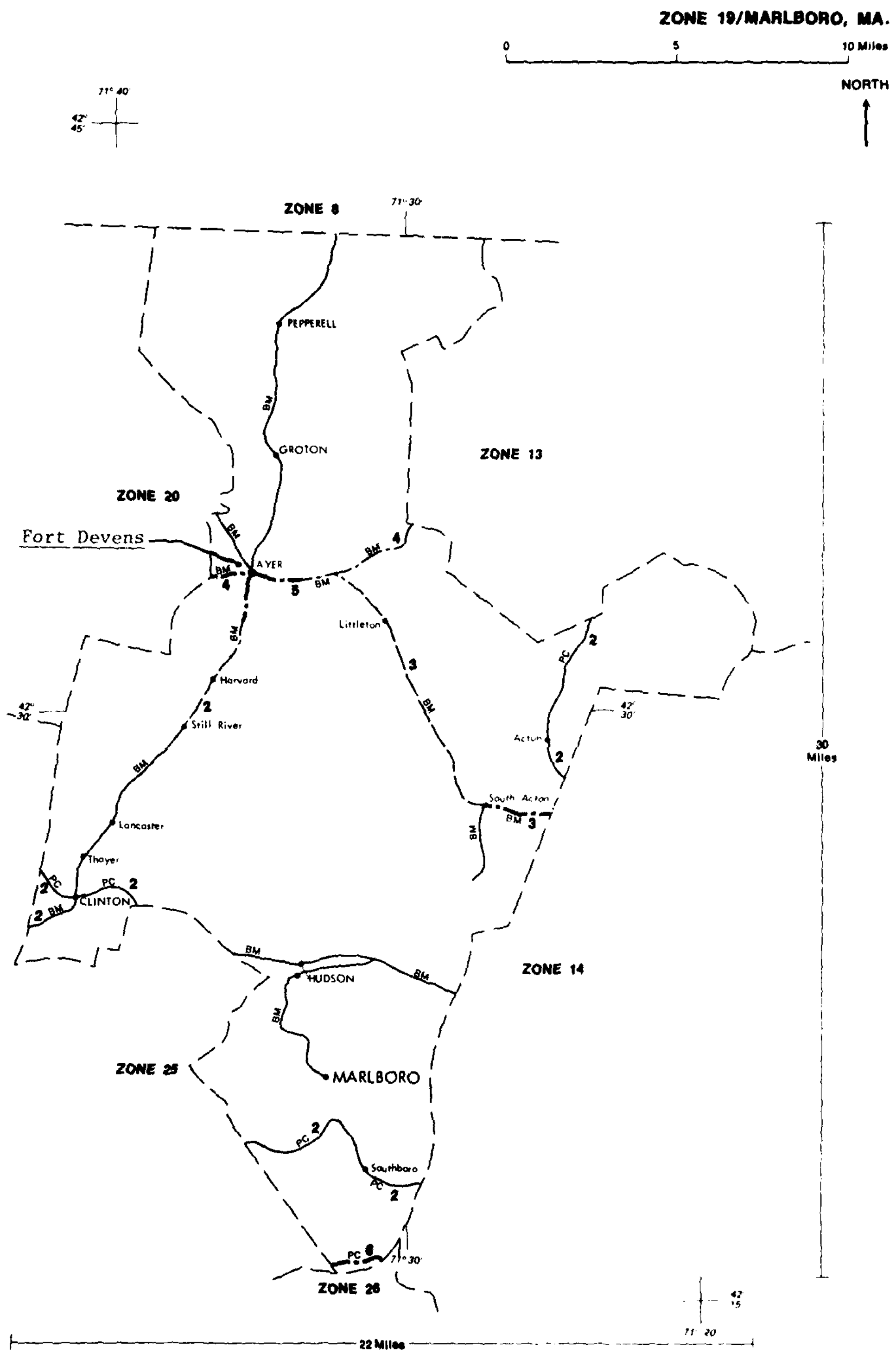

Figure 1. Fort Devens and vicinity.

Findings and recommendations contained in this report are based on analysis of data obtained during the field survey and on other pertinent information relating to installation activities at that time. Any problems incurred in implementing the recommendations should be referred to MTMCTEA for resolution.

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II. ANALYSIS OF FORT DEVENS' RAIL OUTLOADING FACILITIES

A. GENERAL

Discussions with personnel of the Transportation Office at Fort Devens revealed that no large-scale rail operations have occurred at the post in recent years. Adjacent to the Fort Devens east sector is the area occupied by the Massachusetts National Guard, now on semiactive status. Fort Devens and the National Guard share joint rail facilities. All rail switching operations are conducted by the Boston and Maine Railroad. Factual data about locomotive switching and loading, blocking and bracing, and inspection times were obtained from other studies and from the REFORGER 76 exercise.

B. RAIL FACILITY DESCRIPTION

There are 4.23 miles of trackage on the installation, including the National Guard area. The Government trackage, shown in figure 2 and described in table 2, is located in the east sector, in the National Guard area, and in the west sector of Fort Devens. The three rail areas are served by two lead track spurs off the Boston and Maine Railroad marshalling yard that traverses north and south through the approximate center of the installation.

The survey of all sites, on post and in the National Guard area, revealed that seven sites have concrete or asphalt end-loading ramps, one site has a concrete side-loading warehouse dock, and two sites will each require a portable, timber end-loading ramp.

The 4.23 miles of Government track is below the recommended FRA Class 2 safety standard for military installations. The crossties, with about 19 per 39 feet of track, have deteriorated so that there are fewer than 5 nondefective ties per 39 feet of track. The sparse ballast has created a surface drainage problem, which contributes greatly to the already serious condition of crosstie and switchtie deterioration. Shortage of tie plates and deterioration of ties have caused general rail misalignment throughout the installation.

Both the BM lead tracks that join the BM Fort Devens marshalling yard with the Government trackage serving the east and west sectors are below FRA Class 1 safety standard.

The following discussion describes in detail the rail facilities on the installation that would be used to outload equipment in accordance with the recommended plan, Plan 4.

Track 2 (fig 3), a 36-railcar spur, has a large, gravel staging area adjacent to the site and a covered, lighted, concrete warehouse dock that could be used to load boxcars directly from the warehouse. Track 2 has 57-pound rail and deteriorated crossties, which considerably limit heavy railcar operation.

Track 3 (fig 4), a 38-railcar capacity spur, has a large, gravel staging area and a concrete end ramp that could be used to load flatcars with heavy tracked or wheeled vehicles.

Track 4 (fig 5), with a 36-flatcar capacity and an asphalt end ramp, can be used to outload light tracked and wheeled vehicles.

Tank Track (fig 6) can hold 7 flatcars. Wheeled vehicles would have to be loaded from a portable, timber end ramp placed at the north end of the site adjacent to a large, gravel staging area.

Coleman Track 1 (fig 7), located by the POL facility, could be used to load wheeled vehicles off a gravel and concrete end ramp onto 18 flatcars. Although there are four warehouses with seven wood side-loading docks for boxcars, employing the site for flatcars is more practical.

Coleman Track 2 (fig 8), a 17-flatcar-capacity spur, parallel to Coleman track 1, has a concrete end ramp that could be used to outload wheeled vehicles.

Track 5 (fig 9), located in the post east area, with a 20-flatcar capacity and a concrete side ramp, is suitable for outloading wheeled vehicles.

Track 6 (fig 10) could be considered a passing track for track 5; however, 8 flatcars could be loaded with light wheeled vehicles off the wide concrete side ramp used by track 5.

NG Track 1 (fig 11), located in the National Guard area, has a concrete side ramp and a concrete end ramp. The concrete end ramp could be used to load 10 flatcars with heavy tracked or wheeled vehicles.

NG Track 2 (fig 11), a three-car spur, with a concrete end ramp could be used for loading heavy tracked and wheeled vehicles.

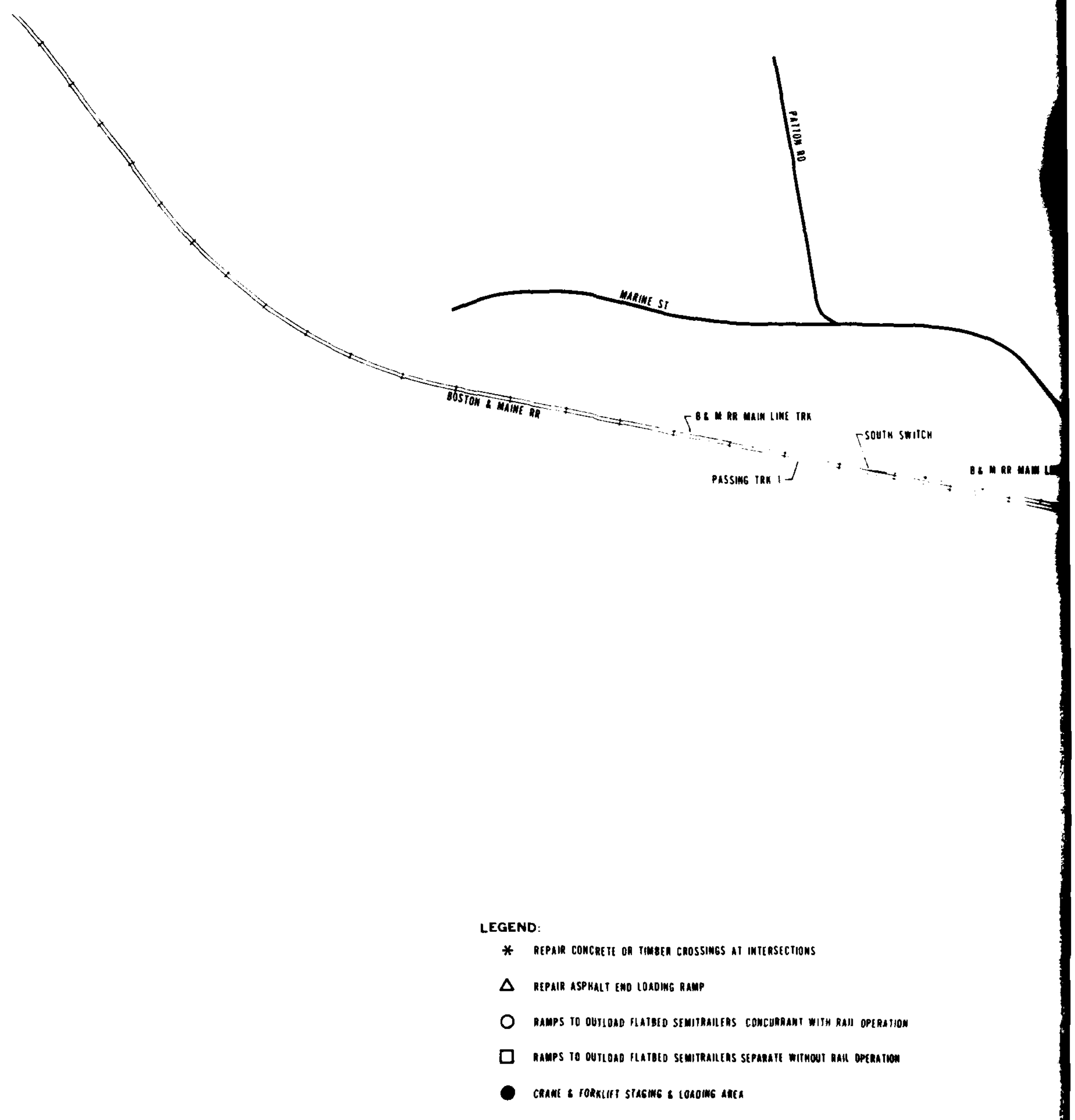
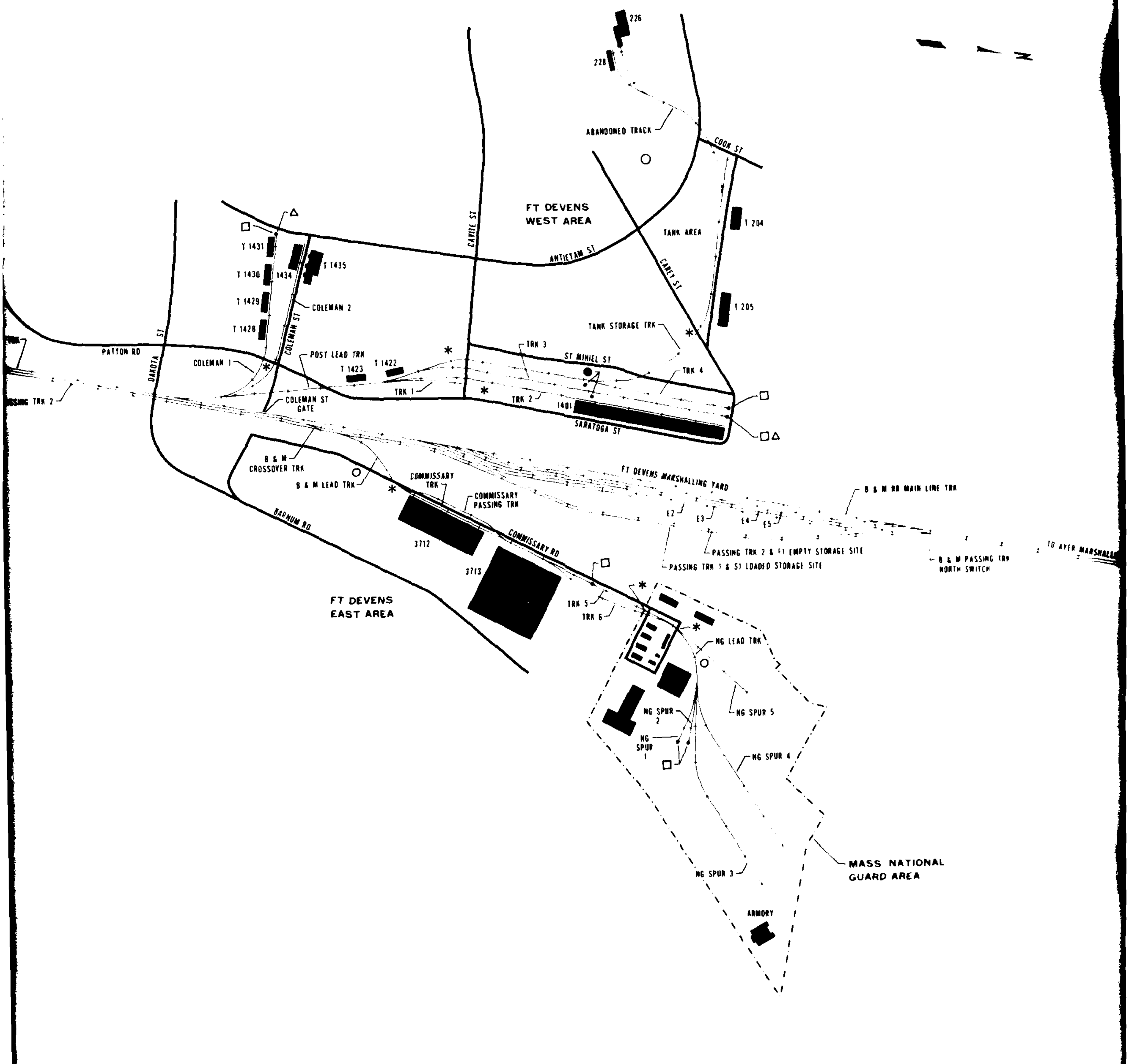
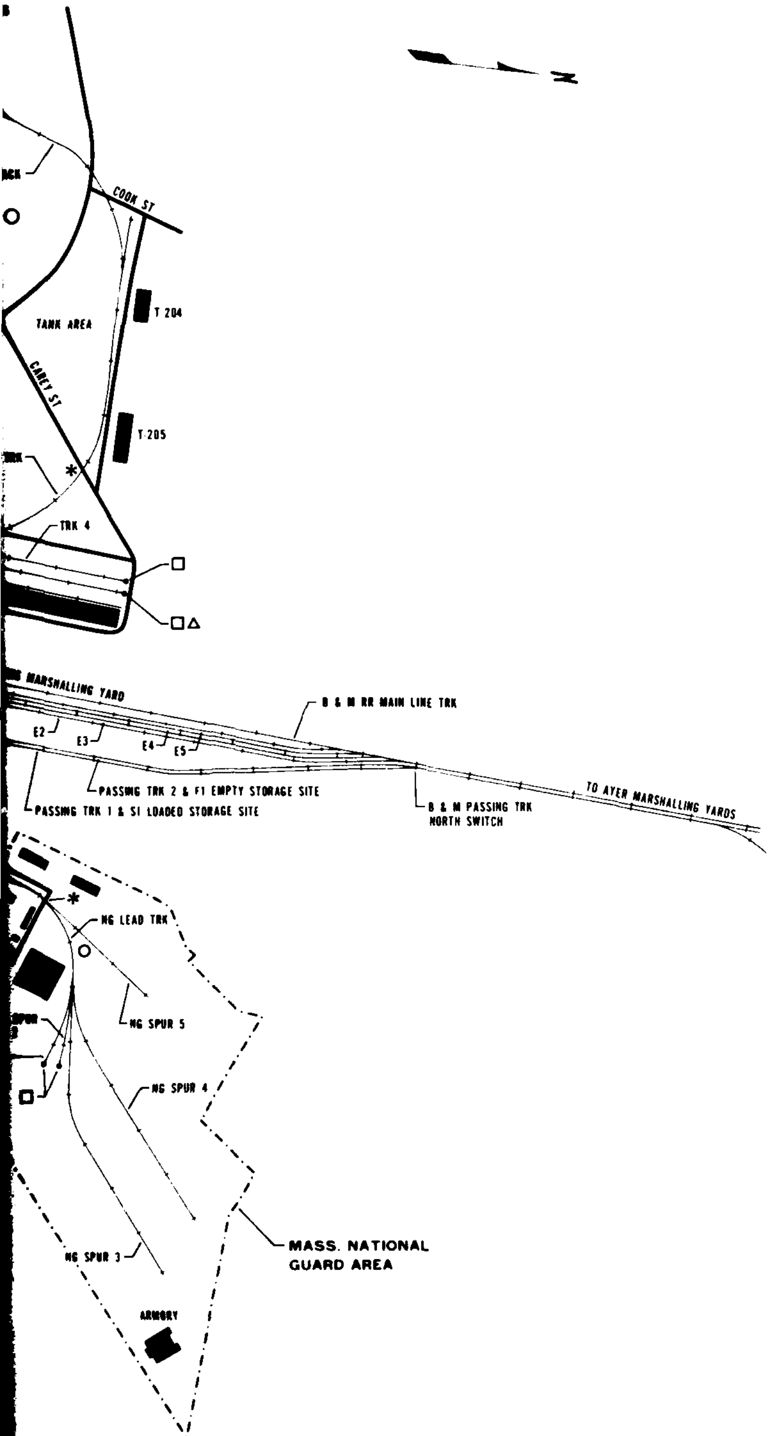


Figure 2. Fort Devens rail system.



226
228
ABANDONED TRACK
COOK ST
FT DEVENS
WEST AREA
TANK AREA
T 204
CAVITE ST
ANTIETAM ST
CAREY ST
T 205
T 1431
T 1430
T 1434
T 1435
T 1429
T 1428
COLEMAN 2
COLEMAN ST
DAKOTA ST
TANK STORAGE TRK
PATTON RD
COLEMAN 1
POST LEAD TRK
T 1423
T 1422
TRK 3
ST MIHIEL ST
TRK 4
TRK 1
TRK 2
1401
SARATOGA ST
PASSING TRK 2
COLEMAN ST
GATE
B & M
CROSSOVER TRK
B & M LEAD TRK
COMMISSARY
TRK
COMMISSARY
PASSING TRK
FT DEVENS MARSHALLING YARD
B & M RR MAIN LINE TRK
E2
E3
E4
E5
BARNUM RD
3712
COMMISSARY RD
3713
PASSING TRK 2 & F1 EMPTY STORAGE SITE
PASSING TRK 1 & S1 LOADED STORAGE SITE
TO AYER MARSHALL
B & M PASSING TRK
NORTH SWITCH
FT DEVENS
EAST AREA
TRK 5
TRK 6
NG LEAD TRK
NG SPUR 5
NG SPUR
2
NG
SPUR
1
NG SPUR 4
MASS NATIONAL
GUARD AREA
NG SPUR 3
ARMORY



COOK ST
TANK AREA
T 204
CAREY ST
T 205
TRK 4
MARSHALLING YARD
B & M RR MAIN LINE TRK
E2
E3
E4
E5
PASSING TRK 2 & F1 EMPTY STORAGE SITE
PASSING TRK 1 & S1 LOADED STORAGE SITE
B & M PASSING TRK
NORTH SWITCH
TO AYER MARSHALLING YARDS
NG LEAD TRK
NG SPUR 5
NG SPUR 4
NG SPUR 3
MASS. NATIONAL
GUARD AREA
ARMORY

TABLE 2
FORT DEVENS RAIL OUTLOADING FACILITIES

Track and Figure No.	Ramp/Dock	Lighting	Surface Condition	Staging Area	Railcar Capacity Feet	Railcar Capacity Cars	Access Availability	Track Condition*	Priority	Note
Track 2 (fig 3)	Yes, ramp and side dock, concrete	Yes	Good	Yes, large, gravel	2,525	36	Good	Poor, below FRA Class 2. Deteriorated ties, no ballast, drainage problem, missing tie plates, 57-pound rail.	1 of 10	Outloading Boxcars from general warehouse, then light tracked and wheeled with a portable timber end ramp.
Track 3 (fig 4)	Yes, concrete end ramp	Yes	Good	Yes, large, gravel	2,200	38	Good	Poor, below FRA Class 2. Deteriorated ties, no ballast, drainage problem, missing tie plates, snowplow damage.	2 of 10	Outloading Heavy tracked or wheeled vehicles.
Track 4 (fig 5)	Yes, asphalt end ramp	Yes	Good	Yes, large, gravel	2,256	36	Good	Poor, below FRA Class 2. Deteriorated ties, no ballast, drainage problem, missing tie plates.	3 of 10	Outloading Light tracked and wheeled vehicles.
Tank Track (fig 6)	No, use portable timber end ramp	No	Good	Yes, large, gravel	2,000	7	Good	Poor, below FRA Class 2. Deteriorated ties, no ballast, drainage problem, snowplow damage.	4 of 10	Outloading Wheeled vehicles.
Coleman Track 1 (fig 7)	Yes, concrete and gravel end ramp	No	Good	Yes, large, gravel and concrete	1,275	18	Good	Poor, below FRA Class 2. Deteriorated ties, no ballast, drainage problem, missing tie plates.	5 of 10	Outloading Wheeled vehicles.
Coleman Track 2 (fig 8)	Yes, concrete end ramp	No	Good	Yes, large, gravel and concrete	1,274	17	Good	Ditto	6 of 10	Outloading Wheeled vehicles.
Track 5 (fig 9)	Yes, concrete side ramp	No	Good	Yes, large, gravel and concrete	1,400	20	Good	Ditto	7 of 10	Outloading Wheeled vehicles.

*See footnote at end of table.

TABLE 2 - cont

Track and Figure No.	Ramp/Dock	Lighting	Surface Condition	Staging Area	Railcar Capacity		Access Availability	Track Condition*	Priority	Note
					Feet	Cars				
Track 6 (fig 10)	Same as above	No	Good	Yes, large, gravel and concrete	899	8	Good	Ditto	8 of 10	Outloading Wheeled vehicles.
NG Track 1 (fig 11)	Yes, concrete side ramp and concrete end ramp	No	Good	Yes, large, gravel	670	10	Good	Ditto	9 of 10	Outloading Heavy tracked and wheeled vehicles.
NG Track 2 (fig 11)	Yes, concrete end ramp	No	Good	Yes, large, gravel	300	3	Good	Ditto	10 of 10	Outloading Heavy tracked and wheeled vehicles.
S1 (fig 12)	No	No	Good	Yes, large, gravel	6,350	89	Poor	FRA Class 2	1 of 1	Loaded storage
E1 (fig 12)	No	No	Good	Yes, large, gravel	3,750	43	Poor	FRA Class 2	1 of 5	Empty storage
E2 (fig 12)	No	No	Good	Yes, large, gravel	3,700	33	Poor	FRA Class 2	2 of 5	Empty storage
E3 (fig 12)	No	No	Good	Yes, large, gravel	3,700	34	Poor	FRA Class 2	3 of 5	Empty storage
E4 (fig 12)	No	No	Good	Yes, large, gravel	3,700	34	Poor	FRA Class 2	4 of 5	Empty storage
E5 (fig 12)	No	No	Good	Yes, large, gravel	3,700	32	Poor	FRA Class 2	5 of 5	Empty storage
Post Lead Track (fig 13)	No	No	Poor	NA	2,074	NA	Poor	Poor, below FRA Class 2. Deteriorated ties, no ballast, drainage problem, missing tie plates	NA	Track connecting the west area loading site trackage with the BM main line
Commissary Track (fig 1[illegible])	Yes, concrete side dock	Yes	Poor	NA	1,600	NA	Poor	Ditto	NA	Track connecting the east area and National Guard area trackage with the BM passing track 1
NG Lead Track (fig 1[illegible])	No	No	Poor	NA	925	NA	Poor	Ditto, plus broken rail	NA	Track connecting the east area loading site trackage with National Guard loading site trackage

*Indicates track condition based on a general inspection, not a detailed inspection of all track components, which might result in a lower classification of the track.

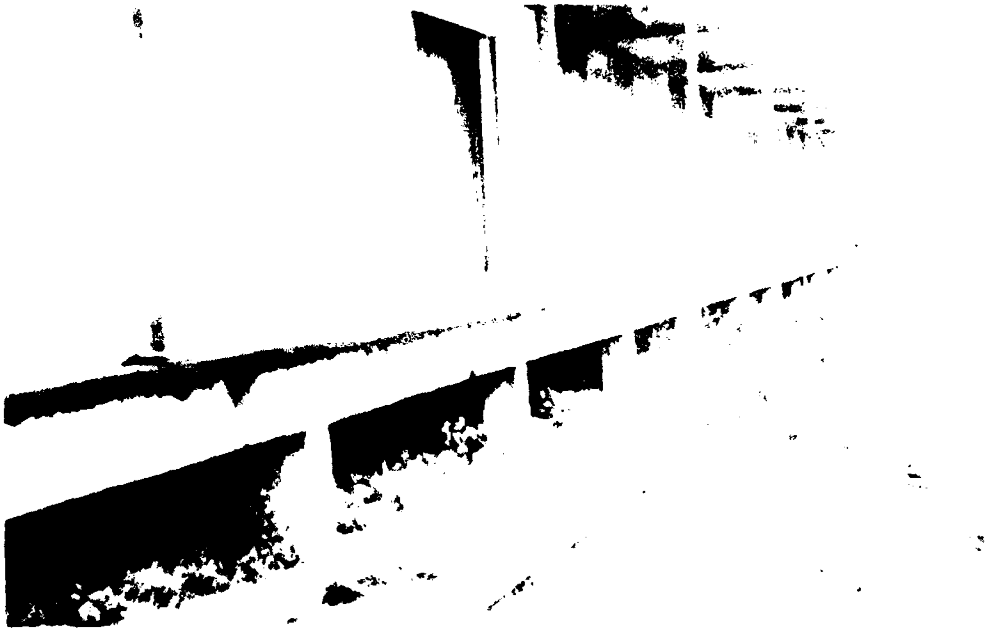


Figure 3. Track 2 and Warehouse 1400.

Figure 4. Track 5, snowplow damage.

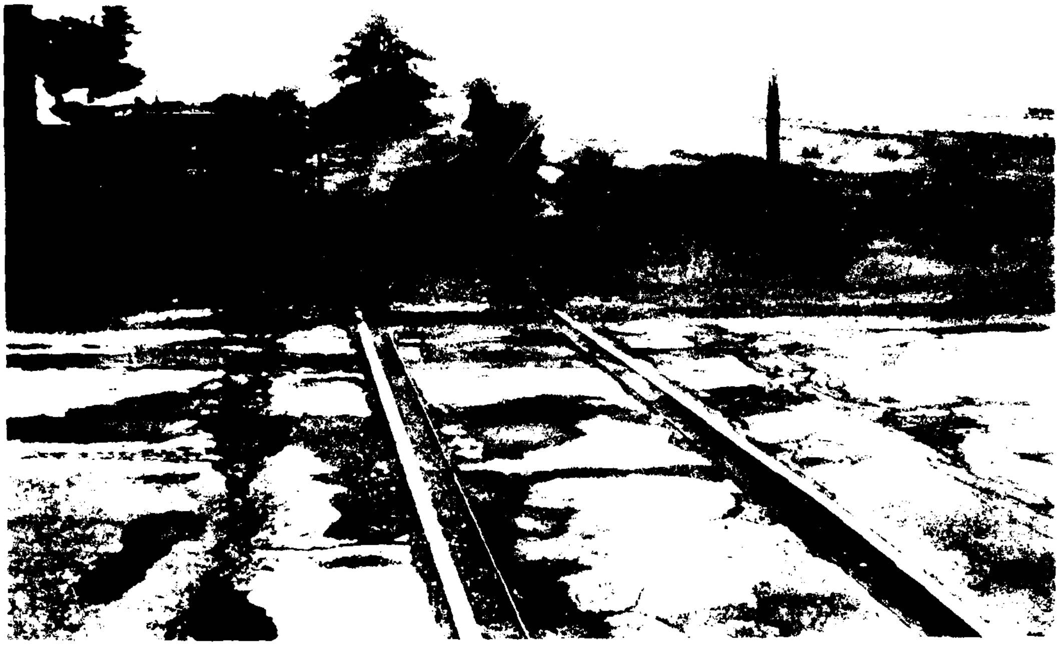


Figure 5. Track 4.

Figure 6. Tank track, snowplow damage.

Figure 7. Coleman track 1.

Figure 8. Coleman track 2.

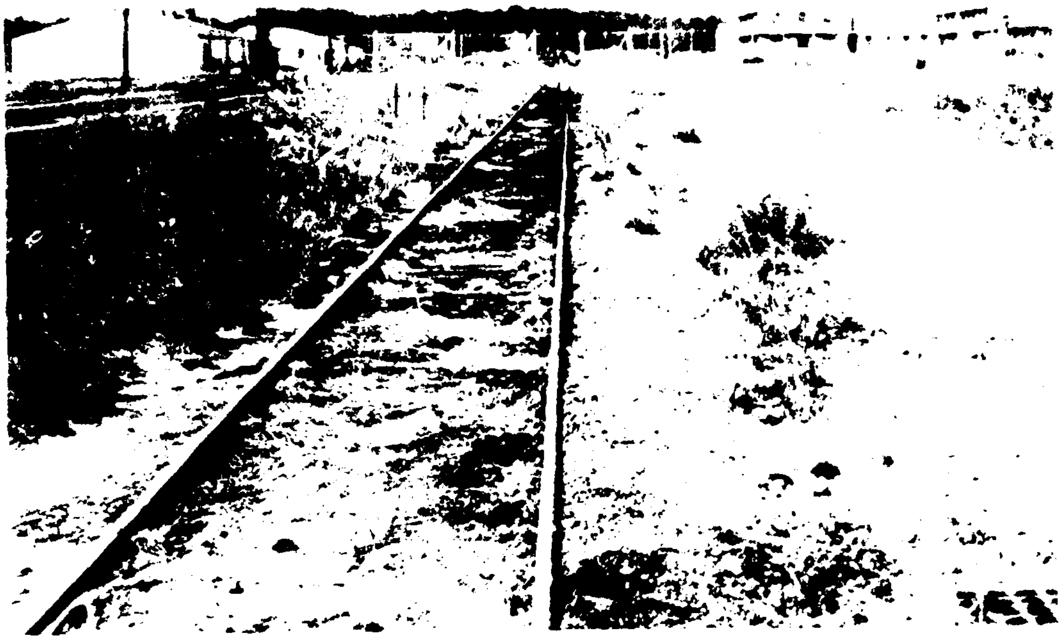


Figure 9. Track 5, left; track 6, right.

Figure 10. Track 6.

Figure 11. NG track 3 (left), NG track 2 (center), and NG track 1 (right).

Track S1 has been designated as a loaded railcar storage site, and tracks E1 through E5 have been designated as empty railcar storage sites. The post, commissary, and National Guard lead tracks are connecting links for major installation areas.

Outbound Track S1 (fig 12) is BM passing track 1, with a holding capacity of 88 loaded railcars, a caboose, and 4 main line locomotives. S1 has 6,250 feet of track and is adequate to accommodate the trains for the outloading operation.

Inbound Track E1 (fig 12) is the section of BM passing track 2 that has 3,700 feet and parallels BM passing track 1. E1 could store 43 empty railcars ready to be shuttled to the loading sites.

Inbound Tracks E2 through E5 (fig 12) are four parallel tracks in the BM Fort Devens marshalling yard and could be used to store 133 empty railcar replacements to replenish vacated loading sites. Inbound tracks E1 through E5 will hold 176 empty railcars, which equals the 10 empty loading-site demands of 19 boxcars and 157 flatcars over a 24-hour period for the first 3 outloading days.

Connecting Lead Tracks (figs 13, 14, 15). The post, commissary, and National Guard lead tracks are connecting links between the installation western and eastern areas.

Figure 12. BM marshalling yard from extreme left. S1 (passing track 1), E1 (passing track 2), E2, E3, E4, and E5.

Figure 13. Post lead track (left), BM main line track (center), BM passing track 2 (near right), and BM passing track 1 (far right).

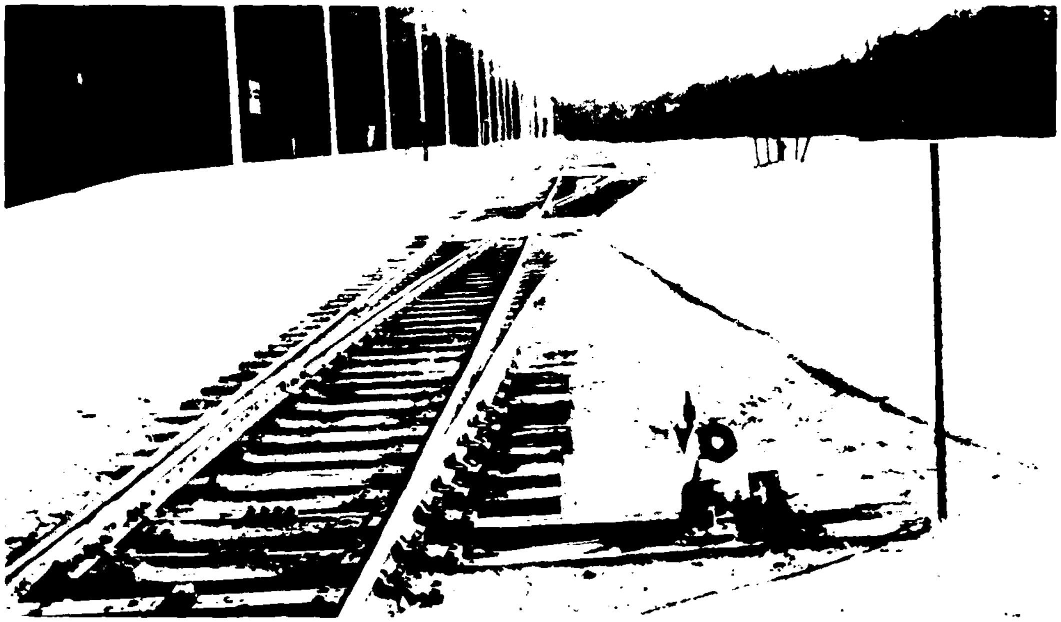


Figure 14. Commissary track (left) and commissary passing track (right).

Figure 15. National Guard track, left; National Guard spur 5, right.

C. CURRENT PROCEDURES

The Boston and Maine Railroad (BM) serves Fort Devens and the Massachusetts Army National Guard area adjacent to Fort Devens. Switching on the installation and at the National Guard area is done by BM 120-ton switch locomotives. Currently, no rail outloading plans have been developed by Fort Devens personnel, and the National Guard has no specific rail requirement plan.

D. RAIL SYSTEM ANALYSIS

1. Current Outloading Capability

Current rail outloading capability at Fort Devens and the National Guard area is limited due to the following constraints:

a. Most trackage is below FRA Class 2 track safety standard.

b. The BM lead track connecting passing track 1 and serving the Fort Devens east area and National Guard area is below FRA Class 1 and has a greater than 12-degree radius of curvature, which frequently results in derailments of 57-foot railcars.

c. Fort Devens lacks blocking and bracing materials, adequately trained blocking and bracing crews, outloading plans, bridge-plates, and small handtools.

d. There is a shortage of nonunit materials handling equipment.

2. Rail Outloading Analysis

A complex system structure can be viewed as a series of interconnected subsystems. The limiting subsystem within the system establishes the maximum outloading capability. Therefore, to ascertain the maximum rail outloading capability of Fort Devens, the following subsystem separation was used:

a. Commercial Service Capabilities

Provided the installation rail facilities are rehabilitated, commercial service capabilities present no problem to Fort Devens. The common carrier serving the post is BM, whose operation in the vicinity of Fort Devens is well organized.

Also, since Ayer, Massachusetts, is a major rail center and is only about 2 miles from Fort Devens, rail support for the outloading operation should not be a major problem.

b. Moving to and Loading on Railcars at a Particular Site

The movement of cargo to loading sites is relatively quick and efficient since most of the equipment is self-propelled and access is along good, paved roads. Traffic patterns and traffic control would have to be set up, but such measures should be standard for full-scale outloading operations. Staging areas near the outloading sites are adequate, but queuing will block some streets. Recent field tests, during loading operations, revealed that vehicles move along the flatcars at an average speed of 1 mile per hour with only one vehicle moving on a railcar at any one time. The longest string of empty flatcars used by the recommended outloading plan, assuming 57-foot car lengths (coupler-to-coupler), was 38 cars. Using that figure, the first vehicle would reach the end of the last car 25 minutes after driving up the ramp; then blocking and bracing could begin. Loading time is insignificant in comparison with blocking and bracing time (table 3). Therefore, moving to and loading on the railcars is not the limiting subsystem. However, driving wheeled vehicles on flatcars "circus style"[3/] depends on the use of bridgeplates to span the gap between the cars. According to the plan employed in our analysis, bridgeplates are required for simultaneous loading at all sites where wheeled vehicles are to be loaded.

c. Blocking, Bracing, and Safety Inspections

Blocking, bracing, and safety inspection times are difficult to project. They depend on a number of variables such as:

(1) Crew size and experience.

(2) Extent of the safety inspection.

(3) Documentation.

3/ Circus-style loading: Equipment is end loaded under its own power with little or no effect to fully utilize all floor space on the railcar, as time is critical.

TABLE 3

TIMES REQUIRED TO PERFORM VARIOUS LOADING FUNCTIONS

	Action	Type Vehicle or Item Being Loaded	How Loaded	Time Required Min-Sec	Considerations
Bilevels	Vehicles Driving on Bilevel Railcars (89-ft long)	Jeep	Own power	1'-00" per Railcar Length	Average of 5 timings
	Vehicles Driving on Bilevel Railcars (89-ft long)	1-1/4-Ton Pickup	Own power	1'-03" per Railcar Length	Average of 6 timings
	Vehicles Driving on Bilevel Railcars (89-ft long)	Gama Goat	Own power	1'-32" per Railcar Length	Average of 8 timings
	Average Total Time to Load, Tiedown Vehicles on Bilevel Railcar, Complete	The three types above plus 3/4-ton trucks, mixed	Own power	34'-00" per Railcar	Average number of Bilevels loaded in string of cars - 15
TOFC's	Truck Tractor Backing Semitrailers on String of 89-ft TOFC Railcars	Semitrailers	Truck tractor	0'-42" per Railcar Length	Average number of TOFC cars in string --11, 2 trailers per car
	Average Total Time to Load and Secure Semi-trailer to Hitch on TOFC Railcar	Semitrailers	Truck tractor	10'-00" per Semi-trailer	Average number of TOFC cars in string --11, 2 trailers per car
Flats	2-1/2-Ton Trucks Circus Loading on 60-ft flats	2-1/2-Ton Trucks	Own power	30"-45" per Railcar Length	Average of several timings
	Total Time to Circus Load 11 60-ft Flats With 2-1/2-Ton Trucks, 2 per car (load only)	2-1/2-Ton Trucks	Own power	35'-00" per 11 60-ft Cars	
Forklift	Average Time for Rough Terrain Forklift Truck to Pick Standard-Size Containers (6-ft Wide, 8-ft Long, 5-ft High Approx) off Flatbed Truck, Transit 75 ft, and Load on Rail Flatcar.	Containers	Forklift	2'-12" per Container	Average of loading of 18 containers

(4) Availability of blocking and bracing material and materials handling equipment (MHE).

During REFORGER 76, the establishment of a 5-1/2- to 7-hour time limit for loading, blocking, and bracing at a loading site, as a reasonable goal for crews, and based on experience and actual field tests of circus-style loadings. In addition, discussions with the blocking and bracing instructors at Fort Eustis, Virginia, indicated that, to avoid wasted manhours, there should be no more than eight men per crew, regardless of experience.

Fort Devens has no blocking and bracing materials. These items, which are available locally, should be stockpiled to assure that the units can be outloaded within the time specified by the contingency plan. Blocking and bracing crews should be trained on a periodic basis.

d. Interchange of Empty and Loaded Railcars

An efficient interchange of empty and loaded railcars requires careful planning and good coordination with the common carrier. If the Government and the BM lead trackage is rehabilitated, such an interchange can be established at the Fort Devens rail areas because BM has good rail access and adequate trackage exists for interchange of railcars.

The existence of a large commercial railyard at Fort Devens and in Ayer makes it possible to accumulate the number of empty cars required to maintain the operation. The various plans for spotting railcars depend on the type of operation. A place or location must be provided for railcars (1) in empty storage, (2) in loaded storage, and (3) at the loading sites. In general, three balanced or equally divided areas must exist somewhere in the vicinity.

Empty railcars destined for Fort Devens should be accumulated and classified in Ayer prior to being moved to the post. Thus, if the interchange of railcars follows some semblance of the organization presented in the simulation (app B), this subsystem will not limit the rail outloading capabilities of Fort Devens.

e. Summary

Considering all the subsystems, the deteriorated condition of the installation and National Guard area trackage; the shortage of blocking and bracing materials, bridgeplates, and small handtools; and the lack of trained blocking and bracing crews emerge as the primary factors restraining the rail outloading operation at Fort Devens.

3. Rail System Outloading Options

Using various combinations of 10 recommended rail loading sites at Fort Devens, five plans were developed for daylight-only loading (fig 16). Four plans were for loading all nonroadable and roadable equipment, and one plan was for loading only nonroadable equipment. The three-balanced-area approach, which includes loading sites, a loaded storage site, and an empty storage site, was utilized at Fort Devens. As soon as the loading, blocking and bracing, and inspection of the cars are completed, the BM switching engines can begin placing the loaded cars in loaded storage for pickup by the BM main line engines. Therefore, through proper planning, the locomotives can bring empties for the next cycle and pick up loaded cars from the loading sites. The exact procedure for all switching operations and for the arrival and departure of main line locomotives is described in detail in the simulation for Plan 4 in appendix B. Five plans were developed to provide the approximate outloading rates of 50, 100, 150, and 176 railcars which also included a 76-car nonroadable equipment plan. All plans function similarly.

Plan 1 uses tracks 2 and 3 and produces 57 railcars per day. Track 2, the general warehouse track, loads 19 boxcars. Track 3 loads 38 flatcars.

Plan 2 adds track 4 and the tank track, with capacities to load 36 and 7 flatcars, respectively, for a total of 100 railcars per day.

Plan 3, which produces an output of 148 railcars per day, requires the addition of Coleman tracks 1 and 2 and NG spurs 1 and 2.

Track Section and Facilities	Railcar Capacity 57-ft Coupler to Coupler	Type of Ramp/Dock or Loading Aid	Repair/Rebuild Items	Plan 1 RC 57	Plan 2 RC [illegible]	Plan 3 RC 148	Plan 4 RC [illegible]	[illegible]
		Side dock, concrete						
Track 2	19	Timber, portable ramp		X	X	X		
Track 3	38	End ramp, concrete			X	X	X	X
Track 4	36	End ramp, asphalt				X	X	
Track 5	20	Side ramp, concrete					X	
Track 6	8	(Same as trk 5 ramp)					X	
Tank Track	[illegible]	Timber, portable ramp				X		
Coleman 1	18	End ramp, asphalt				X	X	
		End ramp, concrete					X	
Coleman 2	[illegible]	Side ramp, concrete				X	X	
NG Spur 1	19	Side ramp, concrete				X	X	X
NG Spur [illegible]	[illegible]	End ramp, concrete				X	X	X
			Rehabilitate the post lead track from north switch to end of track 2 and end of track 3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Same as above, plus rehabilitate track 4 and the tank track					
			Same as above, plus rehabilitate Coleman 1 and 2 tracks, NG spurs 1 and 2, and track 5					
			Same as above, plus rehabilitate track 6					
			Rehabilitate track 2, and NG spurs 1 and 2					
			Repair concrete or asphalt crossing and realign track	4 times 4/	7 times 4/	13 times 4/	13 times 4/	[illegible] times 4/
			Repair timber crossing			2 times 5/	2 times 5/	2 times 5/
			Portable, timber end ramp		2 times 6/	2 times 6/	2 times 6/	6/
			Repair asphalt end ramp		7/	7/	7/	
Estimated total cost				$168,000	$264,000	$404,000	$41[illegible]	$[illegible]

Legend
X - Track is used for that option
RC - Railcars per 24-hour day
* - All estimated costs are based on information from previous rail studies. The estimate is for track material and repair, and for road rail crossing repair. The cost for clearing brush is not included.

Notes

1/ This is the maximum outloading plan. For the first 3 days, 176 railcars, including the boxcar requirement of 19 per day, are outloaded from track [illegible], then track 2 is used for flatcar loading and 36 flatcars are outloaded per day increasing the rate to 193 railcars per day.

2/ Estimated cost to rehabilitate all installation trackage, except track 2, up to an FRA Class 2 standard is $8[illegible]. [illegible] replacing every third defective tie, raising track [illegible] inches, adding [illegible] inches new ballast, tamping ballast, and realigning track.

3/ Estimated cost to rehabilitate track 2 up to an FRA Class 2 standard is $[illegible]. [illegible] includes replacing 57-pound rail with relay rail from abandoned track salvaged from the cold storage spur, replacing ties, raising track [illegible] inches, adding [illegible] new ballast, tamping ballast, and realigning track.

4/ Estimated cost to repair a concrete crossing and realign track is $12,000.

5/ Estimated cost to repair a timber crossing and realign track is $1,760.

6/ Cost to construct a timber portable end ramp or to purchase a portable bridge ramp is $[illegible].

7/ Cost to repair asphalt end ramp is $3,000.

Figure 16. Fort Devens rail system outloading options.

Plan 4, the maximum outloading plan, adds tracks 5 and 6. This plan provides 28 additional flatcars for an outloading capability of 176 railcars per day. Plan 4 fulfills the requirement to outload the units within 10 days and is shown in detail in appendix B.

The nonroadable-equipment-only plan utilizes track 2 and NG spurs 1 and 2 to produce 70 railcars per day. The nonroadable equipment can be outloaded in three days.

4. Analysis of Railcar Requirements

The railcar requirements to outload units to be deployed from Fort Devens are shown in table 4.

TABLE 4
FORT DEVENS RAILCAR REQUIREMENTS

Type of Equipment	Number of Railcars			
	57-Foot	80-Ton	Boxcars	Total
Roadable	1,721			1,721
Nonroadable	98			98
(Tracked)	(38)	3		3
(Others)	(60)			
Miscellaneous	0		57	57
Total	1,819	3	57	1,879

Total rail requirement is 1,879 railcars, including 158 railcars for the nonroadable equipment. The simulation diagram (app B) should be used for outloading these units.

5. Physical Improvements and Additions

Items listed below are all minimum requirements to provide the recommended outloading rate of 176 railcars per day (Plan 4), using existing trackage.

a. In the west area, upgrade to FRA Class 2 standard and/or rehabilitate the following rail facilities:

(1) The post lead track, tank track, tracks 3 and 4, and Coleman tracks 1 and 2. Replace every third defective tie, add missing tieplates, add 6 to 8 inches of new ballast, tamp, and realign track.

(2) Track 2. Replace all 57-pound rail and ties, add 6 to 8 inches of new ballast, tamp, and realign track. (Use 85-pound relay track salvaged from abandoned cold storage track.)

(3) Concrete railroad crossings. Repair and realign track at three intersections on Saratoga Street, three intersections on Cavite Street, and one intersection each on St. Mihiel, Carey, and Coleman Streets.

(4) Asphalt end-loading ramp. Repair ramp at termination of track 4.

b. In the east area, upgrade to FRA Class 2 standard and/or rehabilitate the following rail facilities:

(1) The commissary track, commissary passing track, and tracks 5 and 6. Replace every third defective tie, add missing tieplates, add 6 to 8 inches of new ballast, tamp, and realign track.

(2) The three concrete railroad crossings and the track parallel to Commissary Road. Repair and realign.

c. In the NG area, rehabilitate and upgrade to FRA Class 2 safety standard the following rail facilities:

(1) NG spurs 1 and 2. Replace every third defective tie, add missing tieplates, add 6 to 8 inches of new ballast, tamp, and realign track.

(2) One asphalt and two timber rail crossings, and the NG lead track. Rebuild and realign.

d. Replace or repair broken switch assembly on the NG lead track.

e. Replace bent or broken rail sections on the tank track, track 3, the NG lead track, and NG tracks 1 and 2.

f. Service and grease all switch assemblies, stands, and connecting rods in the east, west, and NG areas.

g. Construct two timber, portable end-loading ramps with structural strength capable of loading heavy wheeled or light tracked vehicles.

h. Acquire a minimum stock of blocking and bracing materials needed to supplement the post organic supply for handling all equipment when a rapid deployment of post units is required.

i. Acquire bridgeplates for volume outloading of wheeled vehicles.

j. Acquire sufficient small tools to permit operation of blocking and bracing crews at all outloading sites. This includes powersaws, cable cutters, wrecking bars, cable-tensioning devices, hammers, and so forth.

6. Discussion of Time and Costs

a. Physical Improvements

The cost estimates (fig 16) cover the rehabilitation of all rail facilities required to implement Plan 4. No dates were given for completion of the required improvements; however, it should be noted that units to be mobilized at Fort Devens could be in a poor contingency situation if definite plans are not formulated. A 1-year target date is recommended.

The Boston FRA representative has submitted to BM a rail facility rejection slip on their lead track connecting passing track 1 with the post commissary track (below FRA Class 1 standard). The FRA track rejection slip requests BM to bring its section of lead track up to a Class 2 standard. However, because the present lead track "S" curves have caused several standard (57-foot length) railcar derailments, the cause should be eliminated. The present BM lead track curves should be straightened to accommodate a 57-foot railcar.

b. Load Time Versus Equipment Type. Two basic types of outloading moves are mobilization and administrative.

(1) Mobilization Moves. Since mobilization moves only occur during national emergencies, urgency is paramount. The most rapid method of loading and securing mobile equipment on railcars is circus style. For example, if unit integrity is to be maintained, 2-1/2-ton trucks, pulling trailers, drive onto the string of railcars, and the equipment is secured in this configuration. This procedure is fast, but it wastes railcar space. During actual field tests on standard-type railcars, for the loading, securing,

and inspecting of 2-1/2-ton trucks, two per railcar, site times varied from 5 hours, for flatcars with chain tiedowns, to 6-1/2 hours, for flatcars without chain tie-downs (fig 17 and table 5, items 4 and 5). This was a fast, efficient operation. Other similar operations that could occur in a mobilization move, for most Army units, include loading various sizes of containers onto standard-type flatcars by using forklifts. This operation, including loading, securing, and so forth, was accomplished in 5-1/2 hours (table 5, item 9). Site loading and securing times for semitrailers and vans on TOFC cars averaged 4 hours. All things considered, the circus-style loading operations indicate that, for mobilization moves, using standard-type flatcars, the loading, blocking and bracing, and inspecting can be accomplished within 5-1/2 to 7 hours for most equipment types (table 5, items 5 and 9). However, if a unit has a significant number of small items, such as "mules" (table 5, item 6), those items are likely to require a 10-hour site time; this should be considered rather than assuming that the work can be accomplished within 7 hours.

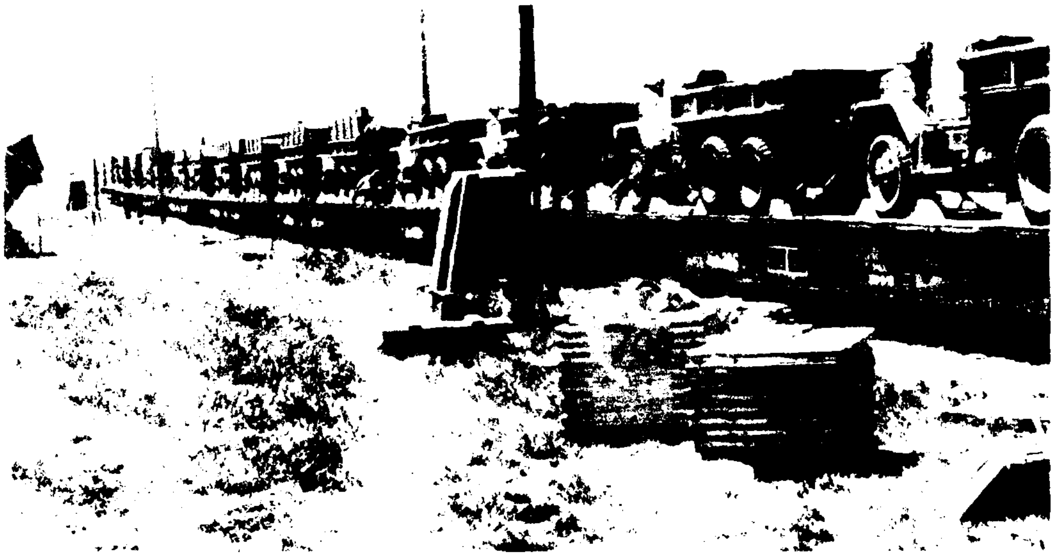


Figure 17. Circus-style loading of 2-1/2-ton trucks; total loading, blocking and bracing, and inspection time is 5 hours.

(2) Administrative Moves. For an administrative move, plenty of time exists for planning; night operations are unnecessary except to finish work that is not completed during daylight hours and to switch railcars. This added flexibility helps to solve unforeseeable problems. An administrative move allows time for accumulating special-type railcars, such as bilevel autoracks and TOFC and COFC cars, which significantly reduce both labor and costs. For instance, small vehicles, such as jeeps, 3/4-ton trucks, 1-1/4-ton trucks, and gama goats, can be loaded on bilevel cars (fig 18); semitrailers and vans can be loaded on TOFC cars; and MILVANs, for which there are no chassis, can be loaded on COFC cars. Mobile equipment, some 2-1/2-ton trucks, and all smaller vehicles can be loaded on bilevel railcars. These three specific types of railcars require no blocking and bracing except that integral to the car.

Loading and securing times for bilevels varied from an average of 7-1/2 hours, for a string of cars that were fully equipped with chain tiedowns, to 10-3/4 hours, for those cars where cable tiedowns had to be fabricated to replace missing chain tiedowns. The average total time for TOFC cars was 4 hours. Administrative loads[4/], which require relatively longer times and more effort, are illustrated in figures 19 and 20. This type of load required a total site time of 10 to 11 hours. In general, administrative moves should be planned for daylight hours, leaving night hours available for finishing up sites that started late or were slowed by problems and railcar switching. This type of planning allows enough flexibility to resolve problems and complete the operation on schedule. For mobilization moves, site times required to load and secure equipment on a string of railcars is 5-1/2 to 7 hours; and for administrative moves, 4 to 11 hours (table 5, items 3 and 7).

[4/] Administrative loading: Equipment to be loaded (wheeled or otherwise) is placed on the car so as to achieve maximum utilization of floor space; it may be stacked; cost is important. Both types of loads, circus and administrative, may be used in either a mobilization or an administrative move, depending upon the type of equipment to be moved. Example: item 9 in a mobilization move, or item 5 in an administrative move.

TABLE 5

TYPICAL SITE LOADING AND BLOCKING AND BRACING TI

LEGEND

Type Railcar

BI - Bilevel

TOFC - Trailer on flatcar

COFC - Container on Flatcar

DF - Flatcar/Integral Chain Tiedown

F - Standard-Type Flatcar

Item	Type Railcar	Average Number Loaded (Range)	Type Load	How Loaded	Total Site Time Required (hrs) and Other Considerations	Details on Type Load
1	BI 89 ft	16 15-17	C	End, own power	7.5 All cars had chain tiedowns. Cars did not have bridge PL's, wooden PL's used	Typical Load: 50 jeeps, 15-3/4-ton 6-1¼ ton, 14 Gama Goats, each level number vehicles - 170
2	BI 89 ft	14½ 11-18	C	End, own power	10.7 All cars did not have chain tiedowns, used wooden bridge PL's.	Typical Load: 50 jeeps, 15-3/4-ton 6-1¼ ton, 14 Gama Goats, each level number vehicles - 170
3	TOFC 89 ft	12 10-12	C	End, backed on by tractor	4.0	Semitrailers - mostly MILVAN marrie to form 40-ft semis. Some 20-ft se military vans on semis. Two per TO
4	DF 60 ft	11 9-14	C	End, own power	5.1 Chain tiedowns on all cars, wood wheel chocks, lateral wood blocking at wheels	All 2-1/2-ton trucks, various kinds per railcar.
5	F 54 ft	10	C	End, own power	6.5 Cable tiedowns made at site. Wheel chocks, lateral wheel blocking	All 2-1/2-ton trucks, various kinds per railcar.
6	F 54 ft	10 9-10	A	End, own power. Some forklift	10.0 Cable tiedowns made at site. Wood blocking as required.	1/4-ton trailers Wreckers Forklifts Mules, jeeps, CONEX containers
7	F 54 ft	9	A	Forklift, manpower	10.8 Cable tiedowns made at site. Wood blocking as required.	All 1/4-ton trailers or high percen of similar small items.
8	DF 60 ft	10 8-13	A	Rough terrain forklifts	8.3 Chain tiedowns on all cars. Wheel blocking used also	All two-wheeled trailers (various pulled by 2-1/2-ton trucks) 5 trailers/railcar
9	F 54 ft	9	A	Rough terrain forklifts	5.5 Cable tiedowns made at site. Blocking as required.	All containers - 5 cars with 8 containers each. 3 cars with 4 containers each. 1 car with 10 containers each.

TABLE 5

PICAL SITE LOADING AND BLOCKING AND BRACING TIMES (1[illegible]L)

ar DF - Flatcar/Integral Chain Tiedowns

tcar F - Standard-Type Flatcar

Type Load
A - Administrative
C - Circus

ed (hrs) ns	Details on Type Load	Manpower	Typical Problems
n ld L's,	Typical Load: 50 jeeps, 15-3/4-ton trucks, 6-1½ ton, 14 Gama Goats, each level, total number vehicles - 170	1½-2 men per vehicle	No bridge PL's on cars had to use wooden PL's. Man has to walk to front of vehicle as guide and to straighten bridge PL's. Delays if all vehicles not at site at loading time.
have sed s.	Typical Load: 50 jeeps, 15-3/4-ton trucks, 6-1½ ton, 14 Gama Goats, each level, total number vehicles - 170	1½-2 men per vehicle	Same as above; and, missing tiedowns; cable tiedowns had to be fabricated and used. (Storm, rain not included in total time)
	Semitrailers - mostly MILVAN married together to form 40-ft semis. Some 20-ft semis and military vans on semis. Two per TOFC car.	6-8 man crew	Some older cars have trailer hitches which have to be "pulled-up" into position by a cable attached to the tractor.
el od	All 2-1/2-ton trucks, various kinds, two per railcar.	10 men per railcar	None
e at s, king	All 2-1/2-ton trucks, various kinds, two per railcar.	10 men per railcar	None
e at ng	1/4-ton trailers Wreckers Forklifts Mules, jeeps, CONEX containers	10 men per railcar	Improper installation of tiedowns and blocking. Large number of small items, 1/4-ton trailer slow the installation of blocking since work has to proceed from one end of railcar to the other.
e at ng	All 1/4-ton trailers or high percentage of similar small items.	10 men per railcar	Improper installation of tiedowns and blocking. Large number of small items, 1/4-ton trailer slow the installation of blocking since work has to proceed from one end of railcar to the other.
all ing	All two-wheeled trailers (various types pulled by 2-1/2-ton trucks) 5 trailers/railcar	10 men per railcar	None noted
e at	All containers - 5 cars with 8 containers each. 3 cars with 4 containers each. 1 car with 10 containers each.	10 men per railcar	None noted

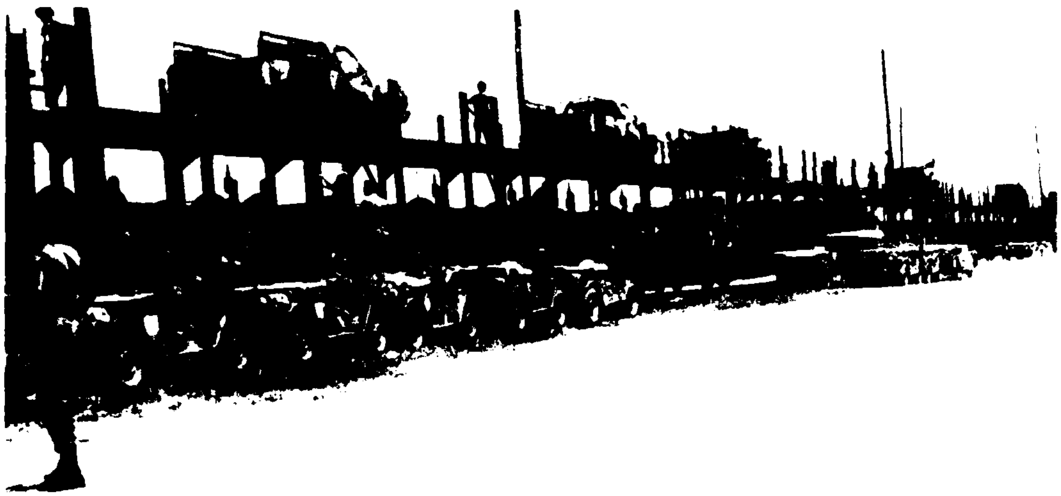


Figure 18. Lower level of bilevel cars loaded with jeeps, gama goats, 3/4-ton trucks, and 1-1/4-ton trucks.

Figure 19. Administrative load, mules.

Figure 20. Administrative load, 1/4-ton trailers.

The time/motion studies conducted during the REFORGER 76 exercise (an administrative move) resulted in the accumulation of valuable information for planning future station outloading operations and is included in tables 3 and 5. It should be noted that the average time required to load is relatively minor when compared with that required to secure the equipment. As an example, a jeep can drive across an 89-foot-long bilevel car in 1 minute, and a forklift truck can load a container in 2 minutes 12 seconds. So, loading times are not the problem. Also, as soon as the first vehicle is in position, several simultaneous operations are in effect--loading, blocking, and tieing down. Thus, as a general rule, for future planning, the following site times should be used: 5-1/2 to 7 hours for a mobilization move, and 4 to 11 hours for an administrative move. The 5-1/2-hour minimum for a mobilization move is based on the assumption that only standard-type railcars are available. The 4-hour minimum for an administrative move carries the assumption that there is time to plan and assemble the most appropriate type of railcars for the equipment to be moved. The 4 hours, in this instance, was the average time required to load and secure semitrailers and vans on a string of twelve 89-foot-long TOFC cars.

To minimize the number of faulty or unacceptable loads that have to be done over, inspection of the loaded cars by the railroad inspector should proceed simultaneously with the work.

c. Transportation Equipment Costs--Bilevel Railcars Versus 54-Foot (Bed Length) Standard Flatcars. A cost comparison, using nine different types of equipment scheduled for outloading in the REFORGER 77 exercise, revealed that $129,431 in transportation and materials (timber, cable, and so forth) could be saved by shipping the equipment on bilevel railcars rather than on standard-type, 54-foot flatcars. The equipment items vary from 1/4-ton trailers to 2-1/2-ton trucks.

A total of 623 vehicles could be transported on 55 bilevel railcars; see table 6 for details and appendix C for more information on special-purpose railcars.

TABLE

COST COMPARISON, BILEVELS V

Column Number	1	2	3	4	5	6
Item No.	Vehicle Type	Model Number	Weight (lbs)	Height (in.)	Length (in.)	Quantity to be Shipped
1	2-1/2-Ton Truck	M35A2	13,360	80.8	264.8	110
2	Gama Goat, 1-1/4-Ton	M561	7,480	71.9	231.1	27 1/
3	M105A2 1-1/2-Ton Trailer	M105A2	2,670	82.0	166.0	113
4	1/4-Ton Trailer	M416	580	44.0	108.5	136
5	400-Gal Water Trailer	M149A1	2,530	80.6	161.4	20
6	1-1/4-Ton Truck	M880	4,695	73.5	218.5	11
7	3/4-Ton Trailer	M101	1,350	50.0	147.0	8
8	1/4-Ton Truck	M151	2,350	52.5	131.5	180
9	1-1/4-Ton Como Truck	M884	4,648	67.5	218.5	18
	Total					623

SUMMARY

Total cost to ship the 9 different items (623 vehicles) by 54-foot-long standard flatcars, Co
Total cost to ship the 9 different items (623 vehicles) by 89-foot-long bilevel flatcars, Col
Savings in transportation costs if shipped by bilevel flats (Column 10-- Column 14)
Additional costs of blocking and bracing materials if shipped by 54-foot standard flatcars
Total savings if these nine items shipped by bilevel versus 54-foot flatcar

1/ Excess vehicles shipped on other railcars that are not completely utilized.

2/ Estimated average additional costs of blocking and bracing materials per vehicle.

TABLE 6

ON, BILEVELS VERSUS 54-FOOT FLATCARS

6 Quantity t... Shipped	7 Quantity on 54-ft Railcar	8 Dollars	9 No. of 54-ft Cars Required	10 (8 x 9) Trans Cost for Item	11 Quantity on 89-ft Bilevel	12 Dollars	13 No. of Bilevels Required	14 (12 x 13) Trans Cost for Item
110	2	2,413	55	132,715	6	7,238	18	130,284
27 1/	2	2,167	13	28,171	8	5,402	4	21,608
113	3	2,167	37	80,179	12	3,612	9	32,508
136	10	2,167	14	30,338	36	3,612	4	25,284
20	4	2,167	5	10,835	12	3,612	2	7,224
11	2	2,167	5	10,835	8	3,612	2	7,224
8	4	2,167	2	4,334	12	3,612	1	3,612
180	7	2,167	25	54,175	14	3,612	13	46,956
18	2	2,167	9	19,503	8	3,612	2	4,334
623				371,085			55	279,034

d flatcars, Column 10	$371,085	
flatcars, Column 14	279,034	
n 14)	$ 92,051	
rd flatcars	37,380	($60 2/ x 623)
	$129,431	

e.

III. ANALYSIS OF COMMERCIAL RAIL FACILITIES WITHIN 25 MILES OF FORT DEVENS

All rail facilities within 25 miles of Fort Devens were analyzed to determine the feasibility of their use during full-scale rail outloading operations at the installation. Many factors were considered in making the determination, including:

a. Road access to the facility.

b. Type of facility available--ramps, lighting.

c. Equipment staging and queuing areas.

d. Railcar storage and loading capacities.

e. Track and facility maintenance conditions.

f. Main line activity levels.

g. Added expense of using commercial facilities.

h. Security problems.

Several considerations narrowed the field of potentially acceptable facilities. Because privately owned rail facilities are not available for military rail outloading operations, commercial rail facilities are the only alternative to using military facilities. The facilities surveyed are located a few miles from the post, and those with a significant potential were considered as possible outloading sites. A BM representative assisted in the analysis of off-post facilities. These facilities are summarized in table 7 and illustrated in figures 21 through 30.

Commercial sites surveyed were:

a. The Boston and Main Railroad yard at Fort Devens and the adjacent Ayer interchange yard, which are major railroad center distribution points (fig 21). The BM Fort Devens yard is rated priority 1 for an all-rail move to outload the contingency unit equipment from the installation. The yard has a large railcar capacity where the loading sites and empty and loaded car storage sites are centralized, cutting loading and switching operations to a minimum. Large, gravel staging areas separate the sites, and the unit equipment can be delivered to the loading areas through a gate located at the foot of the Coleman track 2 street (fig 22).

b. The BM-Ayer interchange yard (fig 23) has three portable bilevel/trilevel auto-loading end ramps. The yard is not recommended for outloading unit equipment because the narrow commercial streets would have to be used as a staging area. The Ayer yard can be used to gather empty railcars prior to their delivery to the installation's vacant loading sites.

c. Groton siding and spur (fig 24), located 7 miles north of Fort Devens, can be used for storing 18 empty cars. Groton has no staging area and there is no road access to the trackage.

d. The BM Shirley siding holds 15 empty cars. Surface conditions are good, but there is no staging area or access road (fig 25).

e. Gardener siding (fig 26) has a 35-railcar capacity, and, although it is 28 miles from the installation, it could be used to store empties prior to the Ayer yard turnover.

f. Clinton spur has a concrete end-loading ramp; however, because of the narrow rural roads and its small 12-car capacity, this BM facility is of no military use (fig 27).

g. Littleton spur (fig 28), 3 miles north of Fort Devens, has a capacity for just eight railcars and no staging area for military operations.

h. Granitville siding's five-railcar capacity is too short and it is inaccessible for vehicles (fig 29).

i. Chelmsford siding, 13 miles north of Fort Devens, holds five railcars and has no staging area adaptable to military use (fig 30).

j. Lowell (fig 31) has a siding and two passing tracks with a capacity of 100 railcars. The facilities are not suitable for outloading military equipment but could serve as an empty-car assembling area prior to a shuttle operation to the Ayer interchange yard.

None of the sites has lighting, and, other than the primary selection (BM Fort Devens marshalling yard), they all have small or no staging areas. Therefore, they are not suggested as outloading sites. All of the sites can be used to store railcars in support of Fort Devens, but the possibility of complications involving security and splitting of operations is an important reason to restrict use of off-post facilities to storage of empty cars only.

TABLE 7

RAILROAD FACILITIES WITHIN 25 MILES OF FORT DEVENS

Location and Figure Number	Road Distance from Fort Devens (miles)	Type Trackage Available	Type Ramps/Docks	Lighting	Surface Conditions	Staging Are[a]	Storage Capacity Railcars 57-Ft L[ength]
BM Ft Devens marshalling yd (not Govt-owned) (fig 21)	At Ft Devens	Inter-change yard	None	No	Good	Several large gravel areas	350
Ayer (fig 23)	2 North of Ft Devens	Inter-change yard	Portable loading ramps	No	Good	Yes	60
Groton (fig 24)	7 North of Ft Devens	Siding and spur	None	No	Good	No	[illegible]
Shirley (fig 25)	3 West of Ft Devens	Siding	None	No	Good	No	15
Gardener (fig 26)	28 West of Ft Devens	Siding	None	No	Good	No	35
Clinton (fig 27)	11 South of Ft Devens	Spur	End ramp, concrete	No	Good	No	12
Littleton (fig 28)	3 North of Ft Devens	Spur	None	No	Good	No	8
Graniteville (fig 29)	6 North of Ft Devens	Siding	None	No	Good	No	[illegible]
Chelmsford (fig 30)	13 North of Ft Devens	Siding	None	No	Good	No	[illegible]
Lowell (fig 31)	18 Northeast of Ft Devens	Siding	None	No	Poor	No	100

TABLE 7
AD FACILITIES WITHIN 25 MILES OF FORT DEVENS

e Docks	Lighting	Surface Conditions	Staging Area	Storage Capacity Railcars 57-Ft Lgs	Access	Remarks
	No	Good	Several large gravel areas	350	Good access gate to staging area	BM tracks chosen as priority one for an all-rail outloading move from a commercial facility. Maximum cost to use - $10,000 for four portable, timber end ramps.
le g	No	Good	Yes	69	Good	BM public tracks and autoloading yard. This yard encompasses several hundred acres and is more than adequate for storing empty cars for Fort Devens.
	No	Good	No	18	Poor	BM tracks good for storing empty cars.
	No	Good	No	15	Poor	BM track good for storing empty cars.
	No	Good	No	35	Poor	BM track good for storing empty cars destined for Ft Devens.
mp, te	No	Good	No	12	Poor	BM track. Narrow rural surface roads are inadequate for military outloading.
	No	Good	No	8	Poor	BM track. Too short. Not accessible to military outloading operations.
	No	Good	No	5	Poor	BM track. Too short. Not accessible to military outloading operations.
	No	Good	No	5	Poor	BM track. Too short.
	No	Poor	No	100	Poor	BM track. Not accessible to military outloading operations.

Figure 21. BM Fort Devens marshalling yard.

Figure 22. Coleman track 2 street gate to BM Fort Devens marshalling yard.

Figure 23. Ayer BM interchange yard.

Figure 24. Groton BM siding (left); end spur (right).

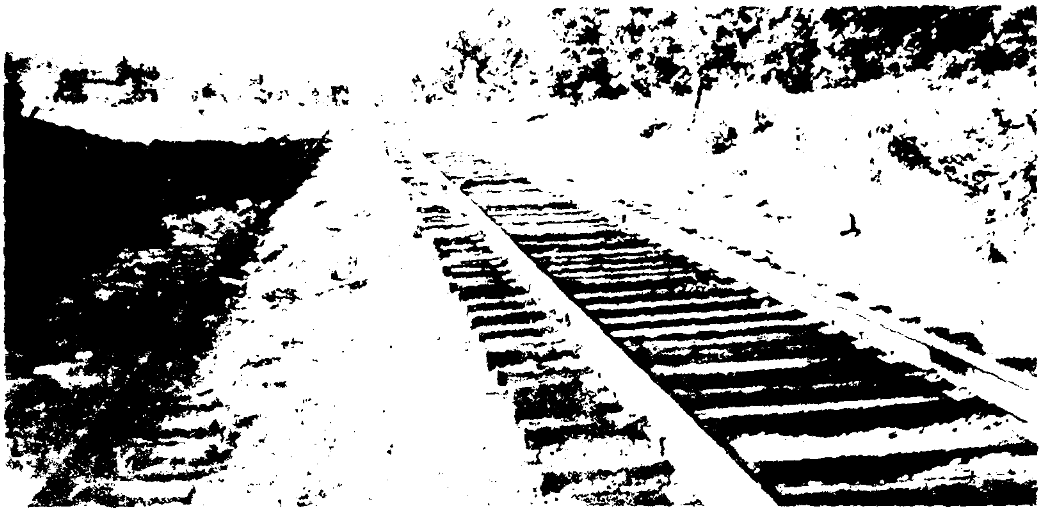


Figure 25. Shirley BM siding (left); and main line (right).

Figure 26. Gardener BM siding (right); two passing tracks (left).

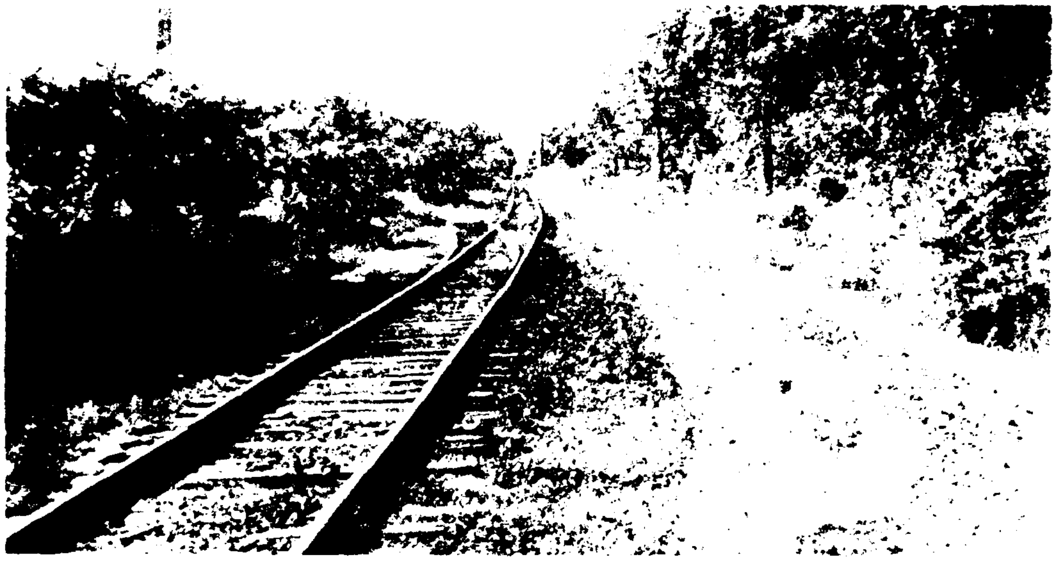


Figure 27. Clinton BM spur.

Figure 28. Littleton BM spur.

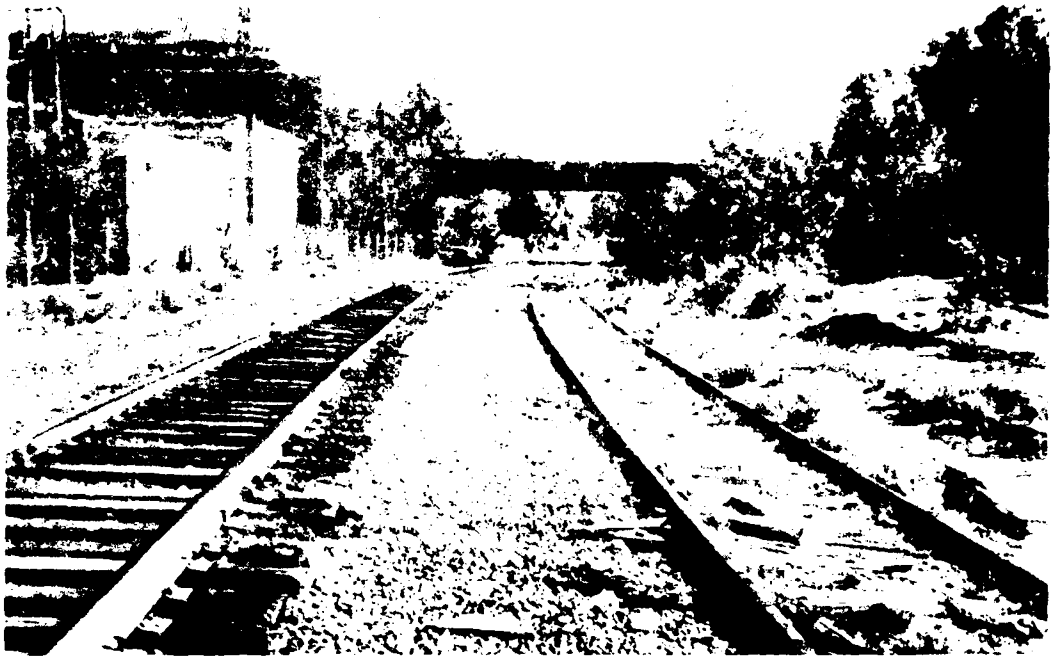


Figure 29. Granitville BM siding.

Figure 30. Chelmsford BM siding.

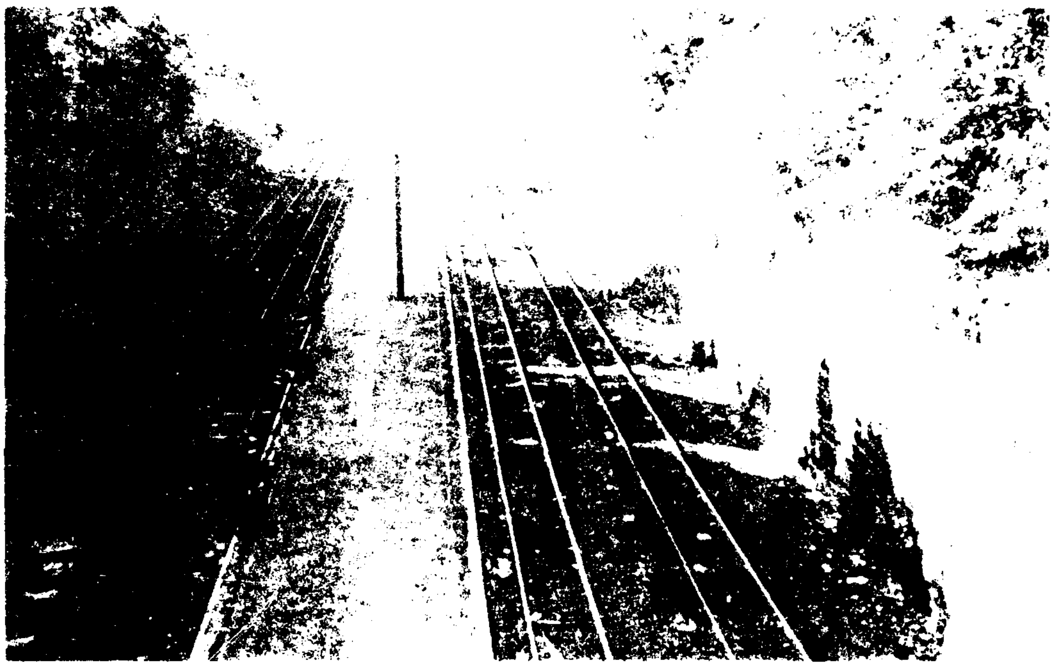


Figure 31. Lowell BM passing tracks (right of platform); main line (left of platform); siding (far left).

IV. SPECIAL EQUIPMENT FOR EXPEDITING THE OUTLOADING OF MILVANS

A large supply of trailer-on-flatcar railcars is usually in the system, and container-on-flatcar railcars may be available. These cars should be used to transport semitrailers and MILVANs. If COFC or TOFC flatcars are not available, some blocking and bracing time and expense can be saved by using bulkhead flatcars for tansporting MILVANs. See appendix C for additional information.

V. ANALYSIS OF MOTOR SYSTEM OUTLOADING CAPABILITY

A. GENERAL

Highway access to Fort Devens is provided by Massachusetts Route 2. This highway connects to Interstate Route 495, 5 miles east of Fort Devens (fig 1). The internal road network within Fort Devens is capable of handling all types of highway vehicles along its major arteries. Neither access to the highway system nor the system itself restrains motor outloading capability or movement of roadable military vehicles.

B. MOTOR LOADING FACILITIES

Basically, three types of motor vehicles--flatbed, heavy-hauler, and van semitrailers--would be required to meet the motor outloading needs of Fort Devens. A description of the loading facilities associated with each vehicle type follows:

1. Loading Ramps

A survey of facilities that have end-loading ramps for loading vehicles onto commercial flatbed semitrailers revealed that there are 3 such ramps with 16 outloading positions that could be used concurrently with a rail outloading operation (table 8 and figs 32 through 41).

Also, concurrent with rail outloading operations, materials handling equipment (MHE), consisting of two 20-ton cranes, two 5-ton cranes, and one 15,000-pound capacity forklift, make a total of five additional outloading positions functioning for flatbed semitrailers. So, there are 21 flatbed semitrailer positions available concurrently with rail outloading operations.

As a separate operation, without rail outloading, there are 7 more loading ramps with 19 outloading positions available for flatbed semitrailers. Thus, for motor-only outloading operations, there are 40 flatbed semitrailer outloading positions available (including MHE positions).

TABLE 8
MOTOR OUTLOADING FACILITIES

Loading Positions or Devices and Figure Number	Location	Type of Ramp/ Dock/Equipment	Surface Condition	Staging	Access	Remarks
Concurrent With Rail Operations						
2 Figure 32	Fuel tank area adjacent to Antietan and Cook Streets	Concrete and gravel end ramp	Good	Yes	Good	For loading heavy tracked and wheeled vehicles onto flatbed or heavy-hauler semitrailers.
13 Figure 33	On Commissary Road adjacent to commissary	Concrete and gravel end ramp	Good	Yes	Good	ditto
1 Figure 34	In National Guard area between NG spurs 4 and 5	Concrete and gravel end ramp	Good	Yes	Good	ditto
10 Figure 35	Warehouse Bldg T-1436	Concrete dock	Good	Yes	Good	For loading van semitrailers
3 Figure 36	Warehouse Bldg T-1434	Concrete dock	Good	Yes	Good	ditto
4 Figure 37	Warehouse Bldg T-1428	Concrete dock	Good	Yes	Good	ditto
4	Warehouse Bldg T-1429	Concrete dock	Good	Yes	Good	ditto
2	Warehouse Bldg T-14[illegible]	Concrete dock	Good	Yes	Good	ditto
4	Warehouse Bldg T-1431	Concrete dock	Good	Yes	Good	ditto
5	Warehouse Bldg T-1400	Concrete dock	Good	Yes	Good	For loading van semitrailers. Lighted
2 20-ton cranes	Mobile, to be used at the general warehouse staging area.	NA	Good	Yes	Good	For loading equipment on flatbed semitrailers
[illegible] 5-ton cranes	Mobile, to be used at the general warehouse staging area.	NA	Good	Yes	Good	ditto
1 [illegible]	Mobile, to be used at the general warehouse staging area	NA	Good	Yes	Good	ditto

TABLE 8 - cont

Loading Positions or Devices and Figure Number	Location	Type of Ramp/ Dock/Equipment	Surface Condition	Staging	Access	Remarks
		Without Rail Operations				
		The following in addition to all of the above				
1 Figure 38	At termination of Coleman 1 track. Adjacent to Bldg T-1431	Concrete and gravel end ramp	Good	Yes	Good	For loading heavy wheeled and light tracked vehicles onto flatbed semitrailers or heavy haulers.
1	At termination of track 3	Concrete end ramp	Good	Yes	Good	For loading heavy tracked and wheeled vehicles onto flatbed semitrailers or heavy haulers. Lighted.
1	At termination of track [illegible]	Asphalt end ramp	Good	Yes	Good	For loading equipment onto flatbed semitrailers. Lighted.
6 Figure 39	On Commissary Road at entrance to National Guard area at track 5	Concrete side ramp	Good	Yes	Good	For loading equipment onto flatbed semitrailer.
9 Figure 40	National Guard spur 1	Concrete side and end ramp. Concrete side ramp	Good	Yes	Good	For loading heavy tracked and wheeled vehicles onto flatbed semitrailers or heavy haulers.
1	National Guard spur 2	Concrete end ramp	Good	Yes	Good	ditto
3	Warehouse Bldg T-1434	Concrete dock	Good	Yes	Good	For loading van semitrailers
3	Warehouse Bldg T-1428	Concrete dock	Good	Yes	Good	ditto
1	Warehouse Bldg T-1429	Concrete dock	Good	Yes	Good	ditto
1	Warehouse Bldg T-1430	Concrete dock	Good	Yes	Good	ditto
2	Warehouse Bldg T-1431	Concrete dock	Good	Yes	Good	ditto
10 Figure 41	Warehouse Bldg T-1400	Concrete dock	Good	Yes	Good	For loading van semitrailers. Lighted.

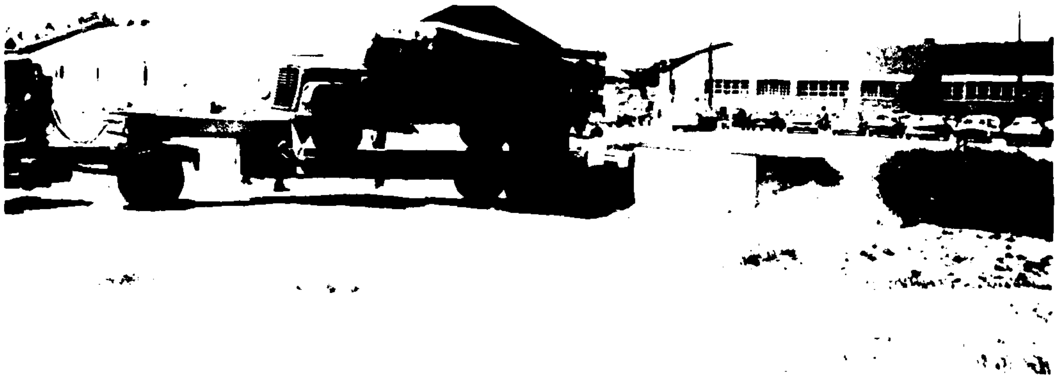


Figure 32. Concrete and gravel end-loading ramp, fuel tank area.

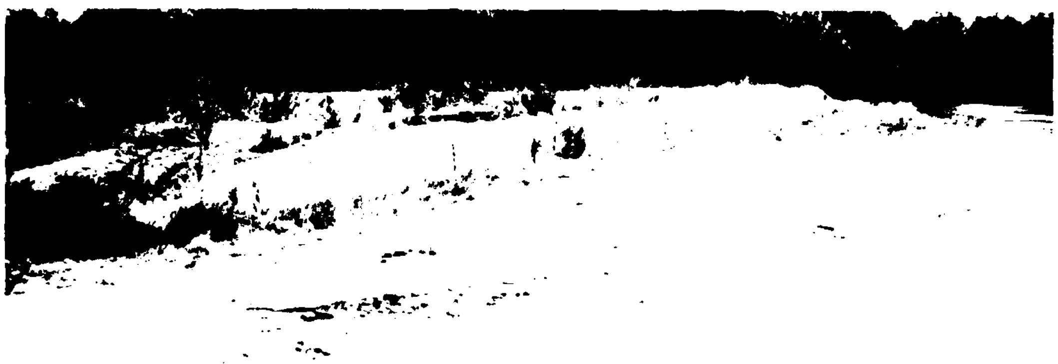


Figure 33. Concrete and gravel end-loading ramp, Commissary Road.

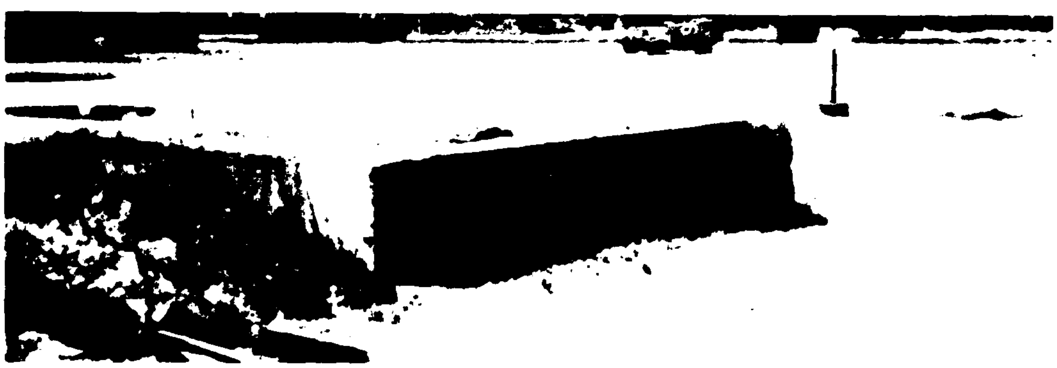


Figure 34. Concrete and gravel end ramp between NG spurs 4 and 5.

Figure 35. Warehouse T-1436 loading dock.

Figure 36. Warehouse T-1434 loading dock.

Figure 37. Warehouse T-1428 loading dock.

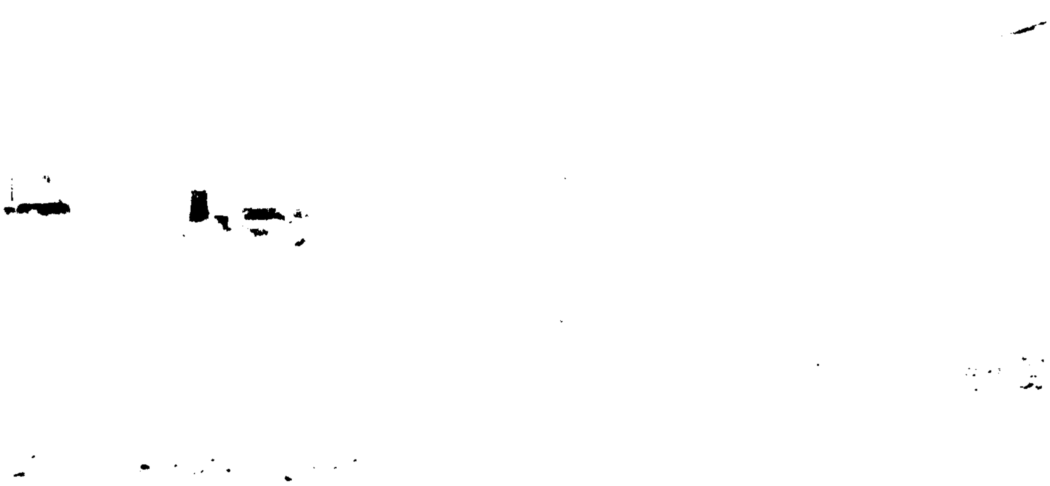


Figure 38. Coleman track 1 end-loading ramp.

Figure 39. Track 5 side-loading ramp.

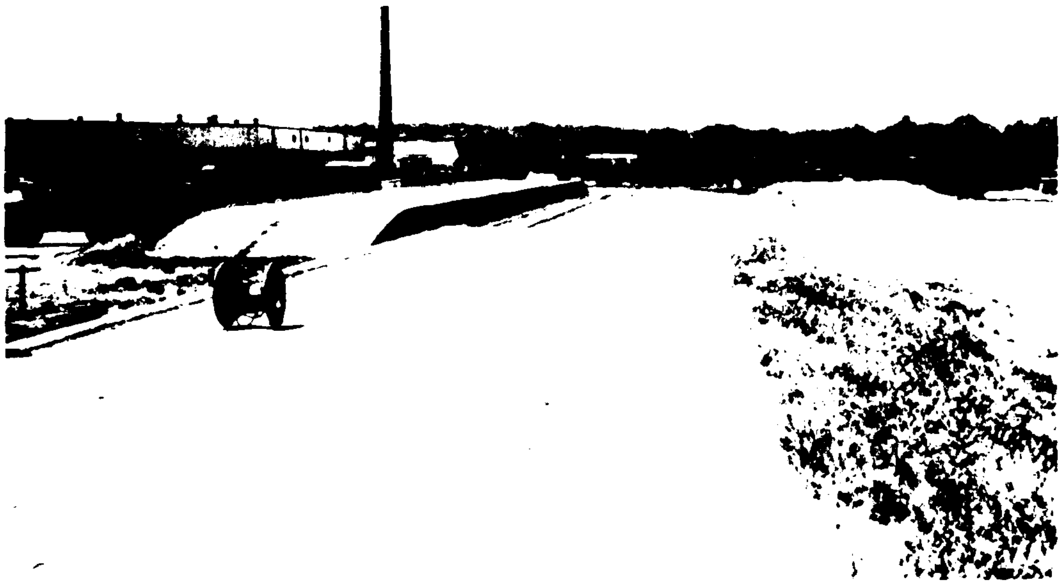


Figure 40. NG spur 1 (left) with end-loading ramp, foreground, and side-loading ramp (left). NG spur 2 and end-loading ramp (right).

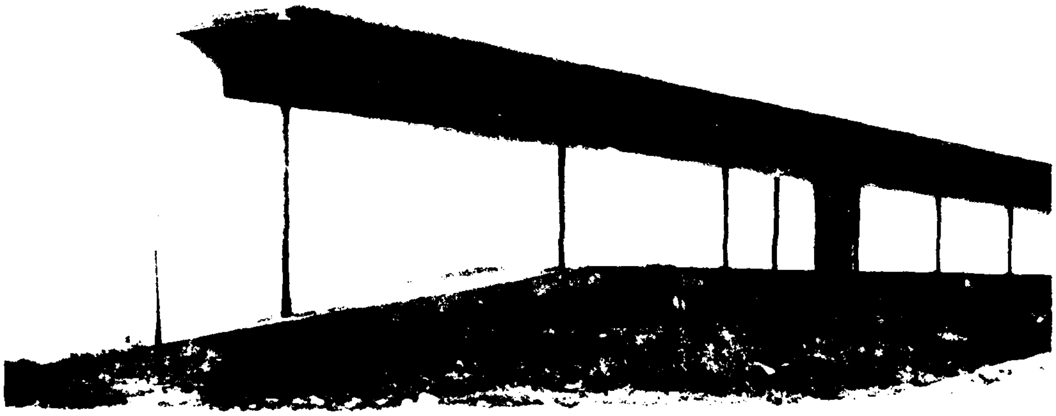


Figure 41. General Warehouse 1400 loading dock.

2. Loading Platforms and Docks

The other type of motor outloading facility is the loading platform from which van semitrailers are loaded. The platform and the forklift are used to transfer cargo from truck to truck, truck to warehouse, and vice versa. Concurrent with rail operations, there are 32 van-semitrailer positions available at docks or platforms. Separate without rail operations, there are 52 van-semitrailer outloading positions at warehouse docks or platforms.

C. FLATBED AND HEAVY-HAULER SEMITRAILERS OUTLOADING

The loading procedure follows: A vehicle is driven up the ramp onto the waiting semitrailer, temporary chocks are placed, and the loaded truck is driven slowly away from the ramp to a designated location, where the loaded vehicle is secured with tiedown chains. The next semitrailer is backed up to the ramp, and the procedure is repeated. Under this procedure, the ramp is not occupied while loaded vehicles are being secured. Using a conservative 60 minutes for each cycle, 1 semitrailer could be loaded per hour per ramp, or 10 vehicles per ramp per 10-hour shift. In most cases, 60 minutes would not be required.

1. Current With Rail Operations

There are 16 concrete/gravel end ramps, 4 crane positions, and a 15,000-pound forklift that could be used while rail operations are in progress. Using a 60-minute cycle per position, a 10-hour workday could produce 210 flatbed/heavy-hauler semitrailer loads for daylight operation only.

2. Without Rail Operations

If rail operations are not in progress, 19 additional positions located at rail-loading concrete side or end ramps can be added to the 21 positions used in the "Concurrent With Rail Operations" section; this would increase the outloading positions to 40. At 60 minutes per cycle per position, 400 flat and heavy-hauler semitrailers could be outloaded in a 10-hour workday.

The possibility of obtaining 400 commercial semitrailers locally on any day is unlikely. Therefore, since Fort Devens has facilities for outloading a large volume of flatbed and heavy-hauler semitrailers, any constraint on its outloading capability is not the lack of facilities but the supply of semitrailers.

D. VAN SEMITRAILER OUTLOADING

The loading procedure could be as follows: A van is backed up to the loading platform, and cargo is transferred to it from either an adjacent van or warehouse. Using one forklift per van being loaded, a cycle time of approximately 2-1/2 hours will be used to load a 40-foot van. At this rate, one van could be loaded per position each 2-1/2 hours, or four vehicles per position, during each 10-hour shift. Using the warehouses listed in table 8, 52 van outloading positions could be utilized. Fort Devens has a minimum of 52 forklifts of the 2,000- and 4,000-pound sizes, which is enough forklifts to outload at each position.

1. Concurrent With Rail Operations

There are 32 forklifts available to load vans at 32 van outloading positions, while rail operations are in progress. Using a 2-1/2-hour loading cycle, a 10-hour workday could produce 128 semitrailer loads for daylight operation only.

2. Without Rail Operations

If rail operations are not in progress, there are 52 forklifts that could be used to load commercial van semitrailers at 52 warehouse positions. At 2-1/2 hours per loading cycle, 52 forklifts operating on a 10-hour workday could produce 208 semitrailer loads for daylight operation only.

E. FLATBED, HEAVY-HAULER, AND VAN SEMITRAILERS OUTLOADING SUMMARY

The flatbed, heavy-hauler, and van semitrailer capability is summarized in table 9. For the installation's peak-equipment mobilization period, there are 3,722 organic roadable vehicles that could be driven to the port of embarkation. All other equipment would be transported by commercial motor and would require 20 van, 111 flatbed, and 66 heavy-hauler semitrailers for ports of embarkation within 800 miles.

Commercial motor service capabilities present no problem at Fort Devens. The supply of van, flatbed, and heavy-hauler semitrailers exceeds the total demand of 197 motor units.

TABLE 9
FLATBED, HEAVY HAULER, AND VAN SEMITRAILERS OUTLOADING SUMMARY

Concurrent With Rail		
Flatbeds	Heavy Hauler	Vans
1 concrete/gravel end ramp (2 positions) 4 cranes (4 positions) 1 forklift (1 position)	2 concrete/gravel end ramps (14 positions)	32 warehouse concrete docks
7 positions	14 positions	32 positions In 10 hrs @ 1 trailer per 2-1/2 hrs and 1 forklift per trailer
In 10 hrs @ 1 trailer per 60 minutes		
70 flatbeds	140 heavy hauler	
Total - 210 flatbeds and heavy haulers		Total - 128 vans
Separate from Rail		
Flatbeds	Heavy Hauler	Vans
5 concrete/gravel end ramps (11 positions) 4 cranes (4 positions) 1 forklift (1 position)	4 concrete/gravel end ramps (24 positions)	52 warehouse concrete docks
16 positions	24 positions	In 10 hrs @ 1 trailer per 2-1/2 hrs and 1 forklift per trailer
In 10 hrs @ 1 trailer per 60 minutes		
160 flatbeds	240 heavy hauler	
Total - 400 flatbeds and heavy haulers		Total - 208 vans

VI. ANALYSIS OF RAIL AND MOTOR MODES

A. GENERAL

The objective of this analysis is to evaluate the four transportation modes identified in table 10 to meet the contingency outloading requirements of Fort Devens. The modes are examined with respect to the following environment:

1. Use of an all-motor mode in lieu of rail.
2. Use of the BM Fort Devens marshalling yard and a motor and rail mode.
3. Use of the all rail facilities in Plan 4.
4. Use of the BM marshalling yard.

In order of priority, a brief overview of the four modes combined with the four alternative outloading sites is presented.

B. ALL-MOTOR MODE[5/] (PRIORITY ONE, FOR PORTS OF EMBARKATION WITHIN 800 MILES)

This mode is recommended as the first priority to outload the installation for ports of embarkation within 800 miles. By using this in lieu of the all-rail mode, only 197 commercial trucks are required to outload all of Fort Devens nonroadable equipment. Also, costs to upgrade rail facilities are not involved. Using onsite flatbed and van semitrailer sites (table 9), this could outload 111 40-foot flats in 2.8 hours, 20 40-foot vans in 1.0 hours, and 66 heavy haulers in 2.8 hours.

[5/] Motor mode--organic roadable vehicles are driven to the designated port of embarkation, while nonroadable vehicles are transported by commercial truck.

TABLE 10
TRANSPORTATION MODE AND EQUIPMENT

Mode	Railcars			Organic	Commercial Trucks		
	57-Ft-Long Flatcars	80-Ton[b/] Flatcars	Boxcars Gondolas	Roadable Vehicles on Road	40-Ft-Long[c/] Flats	40-Ft-Long[d/] Vans	Heavy[e/] Hauler
All-motor[a/]				3,722	111	20	66
Motor and rail	134[f/]	3	57	3,722			0
Partial-motor and rail	125	3	13	3,722	20	69	
All-rail	1,819	3	57				

a/ Preferred mode due to no expenditures and because of the small number of commercial flats, vans, and heavy haulers required (*for ports of embarkation within 800 miles*).

b/ Only equipment weighing more than 61.5 tons must go on heavy duty car.

c/ Equipment weighing less than 40,000 pounds and over 90 inches high or wide.

d/ Equipment weighing less than 40,000 pounds and 90 inches high or wide.

e/ Equipment weighing more than 40,000 pounds.

f/ Thirty-eight railcars required for tracked vehicles only.

C. MOTOR AND RAIL MODE[6/] (PRIORITY TWO, FOR PORTS OF EMBARKATION WITHIN 800 MILES)

The BM Fort Devens marshalling yard is selected as the rail site to outload by both motor and rail, as well as the all-rail move, because it is on-post and it eliminates the cost to rehabilitate the installation's rail facilities.

This mode is rated priority two because it requires a second loading and blocking and bracing operation for the nonvehicular equipment that weighs over 40,000 pounds. This equipment must be loaded, blocked and braced on semitrailers, transported to the yard, and then reloaded and blocked and braced on railcars before it is transported to the POE.

The nonvehicular equipment trucked to the yard will load onto 125 57-foot and 3 80-ton flatcars and 13 boxcars. The lighter nonvehicular equipment, under 40,000 pounds, will use twenty 40-foot flatbed and sixty-nine 40-foot van semitrailers for transport to the POE. The 3,722 organic roadable vehicles would be driven directly to the POE. Disadvantages of using the Fort Devens marshalling yard to outload unit equipment are: portable timber end ramps and cranes to load flatcars, and forklifts to load boxcars from the ground without benefit of docks/ramp. Although there are staging areas between the loading tracks, the commercial rail traffic could present a safety hazard to a military outloading operation.

D. PARTIAL-MOTOR AND RAIL MODE[7/] (PRIORITY THREE, FOR PORTS OF EMBARKATION WITHIN 800 MILES)

This mode cannot be implemented until the installation's west area post lead track, tracks 2 and 3, have been rehabilitated at a cost of $168,105. This would make it possible to outload 55 boxcars in 3 days on track 2 and 137 flatcars in 3.5 days on track 3. Although the outloading operation will take less than 4 days, the cost to outload 192

6/ Motor and rail mode--organic roadable vehicles are driven to the POE. Nonvehicular cargo, weighing less than 40,000 pounds, is transported by commercial van and flatbed semitrailer, and nonvehicular equipment, weighing over 40,000 pounds, is outloaded by rail.

7/ All organic roadable vehicles are driven directly to the POE, and all nonroadable vehicles are transported by rail to the POE.

railcars is prohibitive. Of course the BM marshalling yard could be used for this mode in lieu of expenditures to rehabilitate tracks 2 and 3.

E. ALL-RAIL MODE (PRIORITY ONE, FOR PORTS OF EMBARKATION MORE THAN 800 MILES DISTANT)

The all-rail mode outloads all roadable and nonroadable organic equipment, using 1,819 57-foot flatcars, 3 80-ton flatcars, and 57 boxcars, a total of 1,879 railcars, in 10 days. In addition to the track rehabilitation required for the partial-motor and rail mode, rehabilitation of another 9,282 feet of track will be required. Also to be rehabilitated are 13 concrete or asphalt crossings, 2 timber crossings, and 1 asphalt end ramp. Also two portable timber end ramps will have to be constructed. An all-rail outloading conducted entirely on the installation will cost $413,337; therefore, the BM marshalling yard should be used.

F. SUMMARY

The motor and rail mode, using the BM Fort Devens marshalling yard as the railhead, will not require as many commercial trucks to outload the unit's equipment as the all-motor mode because of the short distance to the railhead. However, it is not practical to truck and then transfer the nonvehicular equipment to railcars because of the time consumed for the two blocking and bracing operations. There is risk of damage to BM trackage or a rail accident traversing the commercial facilities and staging/loading nonroadable heavy tracked and wheeled equipment with heavy commercial rail traffic in the yard.

The large expenditure required to rehabilitate the installation rail system for the partial-motor and all-rail modes is not warranted when 3,722 organic vehicles could be driven to the port of embarkation and only 197 commercial trucks would be required to transport the remaining unit equipment, for ports of embarkation within 800 miles.

When the POE is more than 800 miles distant and the all-rail mode is used, the BM Fort Devens marshalling yard should be selected as the railhead to outload the post equipment.

VII. CONCLUSIONS

1. Most of the Fort Devens and National Guard area trackage has deteriorated and is classified below the recommended military installation track safety standard FRA Class 2. Because of the poor track condition, current rail activity at the installation is minimal.

2. The post trackage lacks ballast, is poorly drained, has deteriorated cross intersections, bent and broken rail, and more than 50-percent deteriorated crossties. Lack of tieplates and insufficient ballast under, around, and in the crib area of the crossties has caused increased stresses, resulting in split rails and ties, and poor track gauge.

3. Track 2, serving General Warehouse 1400, has 57-pound track, which is inadequate to sustain the cargo weight of today's boxcars. The BM lead track to the post west area, is below FRA Class 1 and the BM lead track to the post east area is also below FRA Class 1 and has two curves above the recommended minimum of 12 degrees, a factor in causing frequent derailment.

4. Snowplows have hit, bent, and broken rail on the post and National Guard area.

5. In addition to the poor track conditions on the installation, the face of the asphalt end-loading ramp has crumbled. This condition presents a safety hazard to outloading operations.

6. Two portable timber end ramps are required to load equipment onto the tank track and track located in the post west area.

7. The BM Fort Devens marshalling yard is the only practical outloading railhead. The other nearby commercial railheads cannot accommodate a military outloading operation.

8. Motor and rail outloading is constrained by the shortage of blocking and bracing materials, small handtools, bridgeplates, trained blocking and bracing crews, and outloading plans.

9. For a motor move, 3,722 vehicles could be driven to the POE, and 197 commercial trucks are required to outload the rest of the equipment. Using onsite end- and side-loading ramps, warehouse side-loading docks, and cranes and forklifts, the installation can outload 111 40-foot flats in 2.8 hours; 66 heavy-hauler flats in 2.8 hours; and 20 40-foot vans in 1.0 hour.

10. The organic motor and commercial motor is constrained by the shortage of materials handling equipment and the lack of outloading plans.

11. Empty railcars (dedicated train lengths) destined for Fort Devens should be pre-positioned, in train-loading sequence, in Ayer.

VIII. RECOMMENDATIONS

1. For ports of embarkation within 800 miles, employ an organic motor and commercial motor outloading operation.

    a. Acquire a stock of blocking and bracing material and small handtools, including portable powersaws and cable-tensioning devices.

    b. Provide advance training for blocking and bracing crews.

2. For ports of embarkation farther away than 800 miles, employ an all-rail move.

    a. Use the BM Fort Devens marshalling yard as a railhead. This will require four portable timber end-loading ramps at a total cost of approximately $10,000.

    b. Acquire a stock of blocking and bracing material; bridgeplates; and small handtools, including portable powersaws and cable-tensioning devices.

    c. Provide advance training for blocking and bracing crews.

    d. Provide warehousing for the blocking and bracing supplies.

APPENDIX A
TRACK SAFETY STANDARDS 8/

PART 213—TRACK SAFETY STANDARDS

AUTHORITY: The provisions of this Part 213 issued under sections 202 and 209, 84 Stat. 971, 975; 45 U.S.C 431 and 438 and § 1.49(n) of the Regulations of the Office of the Secretary of Transportation; 49 CFR 1.49(n).

SOURCE: The provisions of this Part 213 appear at 36 F.R. 20336, Oct. 20, 1971, unless otherwise noted.

Subpart A—General

§ 213.1 Scope of part.

This part prescribes initial minimum safety requirements for railroad track

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8/ Extracted from Title 49, Transportation, Parts 200 to 999, pp 8-19, Code of Federal Regulations, 1973.

that is part of the general railroad system of transportation. The requirements prescribed in this part apply to specific track conditions existing in isolation. Therefore, a combination of track conditions, none of which individually amounts to a deviation from the requirements in this part, may require remedial action to provide for safe operations over that track.

§ 213.3 Application.

(a) Except as provided in paragraphs (b) and (c) of this section, this part applies to all standard gage track in the general railroad system of transportation.

(b) This part does not apply to track—

(1) Located inside an installation which is not part of the general railroad system of transportation; or

(2) Used exclusively for rapid transit, commuter, or other short-haul passenger service in a metropolitan or suburban area.

(c) Until October 16, 1972, Subparts A, B, D (except § 213.109), E, and F of this part do not apply to track constructed or under construction before October 15, 1971. Until October 16, 1973, Subpart C and § 213.109 of Subpart D do not apply to track constructed or under construction before October 15, 1971.

§ 213.5 Responsibility of track owners.

(a) Any owner of track to which this part applies who knows or has notice that the track does not comply with the requirements of this part, shall—

(1) Bring the track into compliance; or

(2) Halt operations over that track.

(b) If an owner of track to which this part applies assigns responsibility for the track to another person (by lease or otherwise), any party to that assignment may petition the Federal Railroad Administrator to recognize the person to whom that responsibility is assigned for purposes of compliance with this part. Each petition must be in writing and include the following—

(1) The name and address of the track owner;

(2) The name and address of the person to whom responsibility is assigned (assignee);

(3) A statement of the exact relationship between the track owner and the assignee;

(4) A precise identification of the track;

(5) A statement as to the competence and ability of the assignee to carry out the duties of the track owner under this part; and

(6) A statement signed by the assignee acknowledging the assignment to him of responsibility for purposes of compliance with this part.

(c) If the Administrator is satisfied that the assignee is competent and able to carry out the duties and responsibilities of the track owner under this part, he may grant the petition subject to any conditions he deems necessary. If the Administrator grants a petition under this section, he shall so notify the owner and the assignee. After the Administrator grants a petition, he may hold the track owner or the assignee or both responsible for compliance with this part and subject to penalties under § 213.15.

§ 213.7 Designation of qualified persons to supervise certain renewals and inspect track.

(a) Each track owner to which this part applies shall designate qualified persons to supervise restorations and renewals of track under traffic conditions. Each person designated must have—

(1) At least—

(i) One year of supervisory experience in railroad track maintenance; or

(ii) A combination of supervisory experience in track maintenance and training from a course in track maintenance or from a college level educational program related to track maintenance;

(2) Demonstrated to the owner that he—

(i) Knows and understands the requirements of this part;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements in this part.

(b) Each track owner to which this part applies shall designate qualified persons to inspect track for defects. Each person designated must have—

(1) At least—

(i) One year of experience in railroad track inspection; or

(ii) A combination of experience in track inspection and training from a course in track inspection or from a college level educational program related to track inspection;

(2) Demonstrated to the owner that he—

(i) Knows and understands the requirements of this part;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements of this part, pending review by a qualified person designated under paragraph (a) of this section.

(c) With respect to designations under paragraphs (a) and (b) of this section, each track owner must maintain written records of—

(1) Each designation in effect;

(2) The basis for each designation; and

(3) Track inspections made by each designated qualified person as required by § 213.241.

These records must be kept available for inspection or copying by the Federal Railroad Administrator during regular business hours.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973]

§ 213.9 Classes of track: operating speed limits.

(a) Except as provided in paragraphs (b) and (c) of this section and §§ 213.57 (b), 213.59(a), 213.105, 213.113 (a) and (b), and 213.137 (b) and (c), the following maximum allowable operating speeds apply:

[In miles per hour]

Over track that meets all of the requirements prescribed in this part for —	The maximum allowable operating speed for freight trains is —	The maximum allowable operating speed for passenger trains is—
Class 1 track	10	15
Class 2 track	25	30
Class 3 track	40	60
Class 4 track	60	80
Class 5 track	80	90
Class 6 track	110	110

(b) If a segment of track does not meet all of the requirements for its intended class, it is reclassified to the next lowest class of track for which it does meet all of the requirements of this part. However, if it does not at least meet the requirements for class 1 track, no operations may be conducted over that segment except as provided in § 213.11.

(c) Maximum operating speed may not exceed 110 m.p.h. without prior approval of the Federal Railroad Administrator. Petitions for approval must be filed in the manner and contain the information required by § 211.11 of this chapter. Each petition must provide sufficient information concerning the performance characteristics of the track, signaling, grade crossing protection, trespasser control where appropriate, and equipment involved and also concerning maintenance and inspection practices and procedures to be followed, to establish that the proposed speed can be sustained in safety.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973; 38 FR 23405, Aug. 30, 1973]

§ 213.11 Restoration or renewal of track under traffic conditions.

If, during a period of restoration or renewal, track is under traffic conditions and does not meet all of the requirements prescribed in this part, the work and operations on the track must be under the continuous supervision of a person designated under § 213.7(a).

§ 213.13 Measuring track not under load.

When unloaded track is measured to determine compliance with requirements of this part, the amount of rail movement, if any, that occurs while the track is loaded must be added to the measurement of the unloaded track.

[38 FR 875, Jan. 5, 1973]

§ 213.15 Civil penalty.

(a) Any owner of track to which this part applies, or any person held by the Federal Railroad Administrator to be responsible under § 213.5(c), who violates any requirement prescribed in this part is subject to a civil penalty of at least $250 but not more than $2,500.

(b) For the purpose of this section, each day a violation persists shall be treated as a separate offense.

Exemptions.

(a) Any owner of track to which this part applies may petition the Federal Railroad Administrator for exemption from any or all requirements prescribed in this part.

(b) Each petition for exemption under this section must be filed in the manner and contain the information required by § 211.11 of this chapter.

(c) If the Administrator finds that an exemption is in the public interest and is consistent with railroad safety, he may grant the exemption subject to any conditions he deems necessary. Notice of each exemption granted is published in the FEDERAL REGISTER together with a statement of the reasons therefor.

Subpart B—Roadbed

§ 213.31 Scope.

This subpart prescribes minimum requirements for roadbed and areas immediately adjacent to roadbed.

§ 213.33 Drainage.

Each drainage or other water carrying facility under or immediately adjacent to the roadbed must be maintained and kept free of obstruction, to accommodate expected water flow for the area concerned.

§ 213.37 Vegetation.

Vegetation on railroad property which is on or immediately adjacent to roadbed must be controlled so that it does not—

(a) Become a fire hazard to track-carrying structures;

(b) Obstruct visibility of railroad signs and signals;

(c) Interfere with railroad employees performing normal trackside duties;

(d) Prevent proper functioning of signal and communication lines; or

(e) Prevent railroad employees from visually inspecting moving equipment from their normal duty stations.

Subpart C—Track Geometry

§ 213.51 Scope.

This subpart prescribes requirements for the gage, alinement, and surface of track, and the elevation of outer rails and speed limitations for curved track.

§ 213.53 Gage.

(a) Gage is measured between the heads of the rails at right angles to the rails in a plane five-eighths of an inch below the top of the rail head.

(b) Gage must be within the limits prescribed in the following table:

Class of track	The gage of tangent track must be—		The gage of curved track must be—	
	At least—	But not more than—	At least—	But not more than—
1	4′ 8″	4′ 9¾″	4′ 8″	4′ 9¾″
2 and 3	4′ 8″	4′ 9½″	4′ 8″	4′ 9¾″
4	4′ 8″	4′ 9¼″	4′ 8″	4′ 9½″
5	4′ 8″	4′ 9″	4′ 8″	4′ 9½″
6	4′ 8″	4′ 8¾″	4′ 8″	4′ 9″

§ 213.55 Alinement.

Alinement may not deviate from uniformity more than the amount prescribed in the following table:

Class of track	Tangent track	Curved track
	The deviation of the mid-offset from 62-foot line [1] may not be more than—	The deviation of the mid-ordinate from 62-foot chord [2] may not be more than—
1	5″	5″
2	3″	3″
3	1¾″	1¾″
4	1½″	1½″
5	¾″	⅝″
6	½″	⅝″

[1] The ends of the line must be at points on the gage side of the line rail, five-eighths of an inch below the top of the railhead. Either rail may be used as the line rail, however, the same rail must be used for the full length of that tangential segment of track.

[2] The ends of the chord must be at points on the gage side of the outer rail, five-eighths of an inch below the top of the railhead.

§ 213.57 Curves; elevation and speed limitations.

(a) Except as provided in § 213.63, the outside rail of a curve may not be lower than the inside rail or have more than 6 inches of elevation.

(b) The maximum allowable operating speed for each curve is determined by the following formula:

$$V_{max} = \sqrt{\frac{E_a + 3}{0.0007d}}$$

where

V_{max} = Maximum allowable operating speed (miles per hour).

E_a = Actual elevation of the outside rail (inches).

d = Degree of curvature (degrees).

Appendix A is a table of maximum allowable operating speed computed in accordance with this formula for various elevations and degrees of curvature.

§ 213.59 Elevation of curved track; runoff.

(a) If a curve is elevated, the full elevation must be provided throughout the curve, unless physical conditions do not permit. If elevation runoff occurs in a curve, the actual minimum elevation must be used in computing the maximum allowable operating speed for that curve under § 213.57(b).

(b) Elevation runoff must be at a uniform rate, within the limits of track surface deviation prescribed in § 213.63, and it must extend at least the full length of the spirals. If physical conditions do not permit a spiral long enough to accommodate the minimum length of runoff, part of the runoff may be on tangent track.

§ 213.61 Curve data for Classes 4 through 6 track.

(a) Each owner of track to which this part applies shall maintain a record of each curve in its Classes 4 through 6 track. The record must contain the following information:

(1) Location;

(2) Degree of curvature;

(3) Designated elevation;

(4) Designated length of elevation runoff; and

(5) Maximum allowable operating speed.

[38 FR 875, Jan. 5, 1973]

§ 213.63 Track surface.

Each owner of the track to which this part applies shall maintain the surface of its track within the limits prescribed in the following table:

Track surface	Class of track					
	1	2	3	4	5	6
The runoff in any 31 feet of rail at the end of a raise may not be more than	3½″	3″	2″	1½″	1″	½″
The deviation from uniform profile on either rail at the midordinate of a 62-foot chord may not be more than	3″	2¾″	2¼″	2″	1¼″	½″
Deviation from designated elevation on spirals may not be more than	1¾″	1½″	1¼″	1″	¾″	½″
ariation in cross level on spirals in any 31 feet may not be more than	2″	1¾″	1¼″	1″	¾″	½″
Deviation from zero cross level at any point on tangent or from designated elevation on curves between spirals may not be more than	3″	2″	1¾″	1¼″	1″	½″
The difference in cross level between any two points less than 62 feet apart on tangents and curves between spirals may not be more than	3″	2″	1¾″	1¼″	1″	½″

Subpart D—Track Structure

§ 213.101 Scope.

This subpart prescribes minimum requirements for ballast, crossties, track assembly fittings, and the physical condition of rails.

§ 213.103 Ballast; general.

Unless it is otherwise structurally supported, all track must be supported by material which will—

(a) Transmit and distribute the load of the track and railroad rolling equipment to the subgrade;

(b) Restrain the track laterally, longitudinally, and vertically under dynamic loads imposed by railroad rolling equipment and thermal stress exerted by the rails;

(c) Provide adequate drainage for the track; and

(d) Maintain proper track cross-level, surface, and alinement.

§ 213.105 Ballast; disturbed track.

If track is disturbed, a person designated under § 213.7 shall examine the track to determine whether or not the ballast is sufficiently compacted to perform the functions described in § 213.103. If the person making the examination considers it to be necessary in the interest of safety, operating speed over the disturbed segment of track must be

reduced to a speed that he considers safe.

§ 213.109 Crossties.

(a) Crossties may be made of any material to which rails can be securely fastened. The material must be capable of holding the rails to gage within the limits prescribed in § 213.53(b) and distributing the load from the rails to the ballast section.

(b) A timber crosstie is considered to be defective when it is—

(1) Broken through;

(2) Split or otherwise impaired to the extent it will not hold spikes or will allow the ballast to work through;

(3) So deteriorated that the tie plate or base of rail can move laterally more than one-half inch relative to the crosstie;

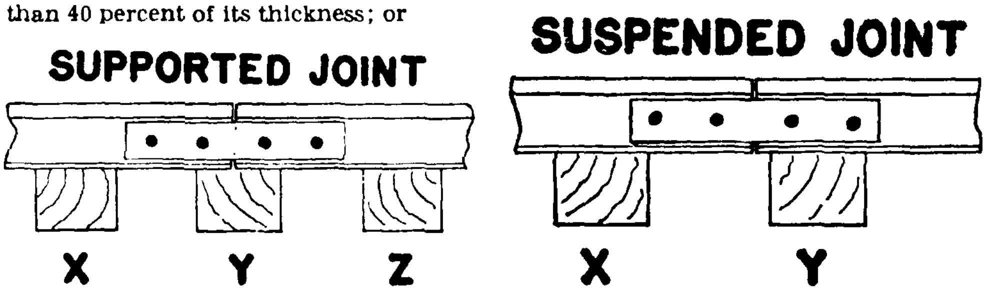
(4) Cut by the tie plate through more than 40 percent of its thickness; or

(5) Not spiked as required by § 213.127.

(c) If timber crossties are used, each 39 feet of track must be supported by nondefective ties as set forth in the following table:

Class of track	Minimum number of nondefective ties per 39 feet of track	Maximum distance between nondefective ties (center to center) (inches)
1	5	100
2, 3	8	70
4, 5	12	48
6	14	48

(d) If timber ties are used, the minimum number of nondefective ties under a rail joint and their relative positions under the joint are described in the following chart. The letters in the chart correspond to letters underneath the ties for each type of joint depicted.



Class of track	Minimum number of nondefective ties under a joint	Required position of nondefective ties	
		Supported joint	Suspended joint
1	1	X, Y, or Z	X or Y.
2, 3	1	Y	X or Y.
4, 5, 6	2	X and Y, or Y and Z.	X and Y.

(e) Except in an emergency or for a temporary installation of not more than 6-months duration, crossties may not be interlaced to take the place of switch ties.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973]

§ 213.113 Defective rails.

(a) When an owner of track to which [illegible] applies learns, through inspec- [illegible] wise, that a rail in that track contains any of the defects listed in the following table, a person designated under § 213.7 shall determine whether or not the track may continue in use. If he determines that the track may continue in use, operation over the defective rail is not permitted until—

(1) The rail is replaced; or

(2) The remedial action prescribed in the table is initiated:

Remedial Action

Defect	Length of defect (inch): More than	Length of defect (inch): But not more than	Percent of railhead cross-sectional area weakened by defect: Less than	Percent of railhead cross-sectional area weakened by defect: But not less than	If defective rail is not replaced, take the remedial action prescribed in note—
Transverse fissure			20		B.
			100	20	B.
				100	A.
Compound fissure			20		B.
			100	20	B.
				100	A.
Detail fracture; Engine burn fracture; Defective weld			20		C.
			100	20	D.
				100	A, or E and H.
Horizontal split head; Vertical split head	0	2			H and F.
	2	4			I and G.
	4				B.
	(Break out in railhead)				A.
Split web; Piped rail; Head web separation	0	½			H and F.
	½	3			I and G.
	3				B.
	(Break out in railhead)				A.
Bolt hole crack	0	½			H and F.
	½	1½			I and G.
	1½				B.
	(Break out in railhead)				A.
Broken base	0	6			E and I.
	6				(Replace rail).
Ordinary break					A *or* E.
Damaged rail					C.

Note:

A—Assign person designated under § 213.7 to visually supervise each operation over defective rail.

B—Limit operating speed to 10 m.p.h. over defective rail.

C—Apply joint bars bolted only through the outermost holes to defect within 20 days *after it is determined to* continue the track in use. In the case of classes 3 through 6 track, limit operating speed over defective rail to 30 m.p.h. until angle bars are applied; thereafter, limit speed to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.

D—Apply joint bars bolted only through the outermost holes to defect within 10 days after it is determined to continue the track in use. Limit operating speed over defective rail to 10 m.p.h. until angle bars are applied; *thereafter, limit speed to 50 m.p.h.* or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.

E—Apply joint bars to defect and bolt in accordance with § 213.121 (d) and (e).

F—Inspect rail 90 days after it is determined to continue the track in use.

G—Inspect rail 30 days after it is determined to continue the track in use.

H—Limit operating speed over defective rail to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.

I—Limit operating speed over defective rail to 30 m.p.h. or the maximum allowable speed under § 213.9 *for the class* of track concerned, whichever is lower.

(b) If a rail in classes 3 through 6 track or class 2 track on which passenger *trains operate evidences any of the conditions* listed in the following table, the remedial action prescribed in the table must be taken:

Condition	Remedial action: If a person designated under § 213.7 determines that condition requires rail to be replaced	Remedial action: If a person designated under § 213.7 determines that condition does not require rail to be replaced
Shelly spots; Head checks; Engine burn (but not fracture); Mill defect	Limit speed to 20 m.p.h. and schedule the rail for replacement.	Inspect the rail for internal defects at intervals of not more than every 12 months.
Flaking; Slivered; Corrugated; Corroded	do	Inspect the rail at intervals of not more than every 6 months.

(c) As used in this section—

(1) "Transverse Fissure" means a progressive crosswise fracture starting from a crystalline center or nucleus inside the head from which it spreads outward as a smooth, bright, or dark, round or oval surface substantially at a right angle to the length of the rail. The distinguishing features of a transverse fissure from other types of fractures or defects are the crystalline center or nucleus and the nearly smooth surface of the development which surrounds it.

(2) "Compound Fissure" means a progressive fracture originating in a horizontal split head which turns up or down in the head of the rail as a smooth, bright, or dark surface progressing until substantially at a right angle to the length of the rail. Compound fissures require examination of both faces of the fracture to locate the horizontal split head from which they originate.

(3) "Horizontal Split Head" means a horizontal progressive defect originating inside of the rail head, usually one-quarter inch or more below the running surface and progressing horizontally in all directions, and generally accompanied by a flat spot on the running surface. The defect appears as a crack lengthwise of the rail when it reaches the side of the rail head.

(4) "Vertical Split Head" means a vertical split through or near the middle of the head, and extending into or through it. A crack or rust streak may show under the head close to the web or pieces may be split off the side of the head.

(5) "Split Web" means a lengthwise crack along the side of the web and extending into or through it.

(6) "Piped Rail" means a vertical split in a rail, usually in the web, due to failure of the sides of the shrinkage cavity in the ingot to unite in rolling.

(7) "Broken Base" means any break in the base of a rail.

(8) "Detail Fracture" means a progressive fracture originating at or near the surface of the rail head. These fractures should not be confused with transverse fissures, compound fissures, or other defects which have internal origins. Detail fractures may arise from shelly spots, head checks, or flaking.

(9) "Engine Burn Fracture" means a progressive fracture originating in spots where driving wheels have slipped on top of the rail head. In developing downward they frequently resemble the compound or even transverse fissure with which they should not be confused or classified.

(10) "Ordinary Break" means a partial or complete break in which there is no sign of a fissure, and in which none of the other defects described in this paragraph are found.

(11) "Damaged rail" means any rail broken or injured by wrecks, broken, flat, or unbalanced wheels, slipping, or similar causes.

(12) "Shelly spots" means a condition where a thin (usually three-eighths inch in depth or less) shell-like piece of surface metal becomes separated from the parent metal in the railhead, generally at the gage corner. It may be evidenced by a black spot appearing on the railhead over the zone of separation or a piece of metal breaking out completely, leaving a shallow cavity in the railhead. In the case of a small shell there may be no surface evidence, the existence of the shell being apparent only after the rail is broken or sectioned.

(13) "Head checks" mean hair fine cracks which appear in the gage corner of the rail head, at any angle with the length of the rail. When not readily visible the presence of the checks may often be detected by the raspy feeling of their sharp edges.

(14) "Flaking" means small shallow flakes of surface metal generally not more than one-quarter inch in length or width break out of the gage corner of the railhead.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973; 38 FR 1508, Jan. 15, 1973]

§ 213.115 Rail end mismatch.

Any mismatch of rails at joints may not be more than that prescribed by the following table:

Class of track	Any mismatch of rails at joints may not be more than the following—	
	On the trend of the rail ends (inch)	On the gage side of the rail ends (inch)
1	1/4	1/4
2	1/4	3/16
3	3/16	3/16
4, 5	1/8	1/8
6	1/8	1/8

§ 213.117 Rail end batter.

(a) Rail end batter is the depth of depression at one-half inch from the rail end. It is measured by placing an 18-inch straightedge on the tread on the rail end, without bridging the joint, and measuring the distance between the bottom of the straightedge and the top of the rail at one-half inch from the rail end.

(b) Rail end batter may not be more than that prescribed by the following table:

Class of track	*Rail end batter may not be more than— (inch)*
1	1/2
2	3/8
3	3/8
4	1/4
5	1/8
6	1/8

§ 213.119 Continuous welded rail.

(a) When continuous welded rail is being installed, it must be installed at, or adjusted for, a rail temperature range

that should not result in compressive or tensile forces that will produce lateral displacement of the track or pulling apart of rail ends or welds.

(b) After continuous welded rail has been installed it should not be disturbed at rail temperatures higher than its installation or adjusted installation temperature.

§ 213.121 Rail joints.

(a) Each rail joint, insulated joint, and compromise joint must be of the proper design and dimensions for the rail on which it is applied.

(b) If a joint bar on classes 3 through 6 track is cracked, broken, or because of wear allows vertical movement of either rail when all bolts are tight, it must be replaced.

(c) If a joint bar is cracked or broken between the middle two bolt holes it must be replaced.

(d) In the case of conventional jointed track, each rail must be bolted with at least two bolts at each joint in classes 2 through 6 track, and with at least one bolt in class 1 track.

(e) In the case of continuous welded rail track, each rail must be bolted with at least two bolts at each joint.

(f) Each joint bar must be held in position by track bolts tightened to allow the joint bar to firmly support the abutting rail ends and to allow longitudinal movement of the rail in the joint to accommodate expansion and contraction due to temperature variations. When out-of-face, no-slip, joint-to-rail contact exists by design, the requirements of this paragraph do not apply. Those locations are considered to be continuous welded rail track and must meet all the requirements for continuous welded rail track prescribed in this part.

(g) No rail or angle bar having a torch cut or burned bolt hole may be used in classes 3 through 6 track.

§ 213.123 Tie plates.

(a) In classes 3 through 6 track where timber crossties are in use there must be tie plates under the running rails on at least eight of any 10 consecutive ties.

(b) Tie plates having shoulders must be placed so that no part of the shoulder is under the base of the rail.

§ 213.125 Rail anchoring.

Longitudinal rail movement must be effectively controlled. If rail anchors which bear on the sides of ties are used for this purpose, they must be on the same side of the tie on both rails.

§ 213.127 Track spikes.

(a) When conventional track is used with timber ties and cut track spikes, the rails must be spiked to the ties with at least one line-holding spike on the gage side and one line-holding spike on the field side. The total number of track spikes per rail per tie, including plate-holding spikes, must be at least the number prescribed in the following table:

MINIMUM NUMBER OF TRACK SPIKES PER RAIL PER TIE, INCLUDING PLATE-HOLDING SPIKES

Class of track	Tangent track and curved track with not more than 2° of curvature	Curved track with more than 2° but not more than 4° of curvature	Curved track with more than 4° but not more than 6° of curvature	Curved track with more than 6° of curvature
1	2	2	2	2
2	2	2	2	3
3	2	2	2	3
4	2	2	3	----------
5	2	3	----------	----------
6	2	----------	----------	----------

(b) A tie that does not meet the requirements of paragraph (a) of this section is considered to be defective for the purposes of § 213.109(b).

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.129 Track shims.

(a) If track does not meet the geometric standards in Subpart C of this part and working of ballast is not possible due to weather or other natural conditions, track shims may be installed to correct the deficiencies. If shims are used, they must be removed and the track resurfaced as soon as weather and other natural conditions permit.

(b) When shims are used they must be—

(1) At least the size of the tie plate;

(2) Inserted directly on top of the tie, beneath the rail and tie plate;

(3) Spiked directly to the tie with spikes which penetrate the tie at least 4 inches.

(c) When a rail is shimmed more than 1½ inches, it must be securely braced on at least every third tie for the full length of the shimming.

(d) When a rail is shimmed more than 2 inches a combination of shims and 2-

inch or 4-inch planks, as the case may be, must be used with the shims on top of the planks.

§ 213.131 **Planks used in shimming.**

(a) Planks used in shimming must be at least as wide as the tie plates, but in no case less than 5½ inches wide. Whenever possible they must extend the full length of the tie. If a plank is shorter than the tie, it must be at least 3 feet long and its outer end must be flush with the end of the tie.

(b) When planks are used in shimming on uneven ties, or if the two rails being shimmed heave unevenly, additional shims may be placed between the ties and planks under the rails to compensate for the unevenness.

(c) Planks must be nailed to the ties with at least four 8-inch wire spikes. Before spiking the rails or shim braces, planks must be bored with ⅝-inch holes.

§ 213.133 **Turnouts and track crossings generally.**

(a) In turnouts and track crossings, the fastenings must be intact and maintained so as to keep the components securely in place. Also, each switch, frog, and guard rail must be kept free of obstructions that may interfere with the passage of wheels.

(b) Classes 4 through 6 track must be equipped with rail anchors through and on each side of track crossings and turnouts, to restrain rail movement affecting the position of switch points and frogs.

(c) Each flangeway at turnouts and track crossings must be at least 1½ inches wide.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.135 **Switches.**

(a) Each stock rail must be securely seated in switch plates, but care must be used to avoid canting the rail by overtightening the rail braces.

(b) Each switch point must fit its stock rail properly, with the switch stand in either of its closed positions to allow wheels to pass the switch point. Lateral and vertical movement of a stock rail in the switch plates or of a switch plate on a tie must not adversely affect the fit of the switch point to the stock rail.

(c) Each switch must be maintained so that the outer edge of the wheel tread cannot contact the gage side of the stock rail.

(d) The heel of each switch rail must be secure and the bolts in each heel must be kept tight.

(e) Each switch stand and connecting rod must be securely fastened and operable without excessive lost motion.

(f) Each throw lever must be maintained so that it cannot be operated with the lock or keeper in place.

(g) Each switch position indicator must be clearly visible at all times.

(h) Unusually chipped or worn switch points must be repaired or replaced. Metal flow must be removed to insure proper closure.

§ 213.137 **Frogs.**

(a) The flangeway depth measured from a plane across the wheel-bearing area of a frog on class 1 track may not be less than 1⅜ inches, or less than 1½ inches on classes 2 through 6 track.

(b) If a frog point is chipped, broken, or worn more than five-eighths inch down and 6 inches back, operating speed over that frog may not be more than 10 miles per hour.

(c) If the tread portion of a frog casting is worn down more than three-eighths inch below the original contour, operating speed over that frog may not be more than 10 miles per hour.

§ 213.139 **Spring rail frogs.**

(a) The outer edge of a wheel tread may not contact the gage side of a spring wing rail.

(b) The toe of each wing rail must be solidly tamped and fully and tightly bolted.

(c) Each frog with a bolt hole defect or head-web separation must be replaced.

(d) Each spring must have a tension sufficient to hold the wing rail against the point rail.

(e) The clearance between the hold-down housing and the horn may not be more than one-fourth of an inch.

§ 213.141 **Self-guarded frogs.**

(a) The raised guard on a self-guarded frog may not be worn more than three-eighths of an inch.

(b) If repairs are made to a self-guarded frog without removing it from service, the guarding face must be restored before rebuilding the point.

§ 213.143 Frog guard rails and guard faces; gage.

The guard check and guard face gages in frogs must be within the limits prescribed in the following table:

Class of track	Guard check gage — The distance between the gage line of a frog to the guard line [1] of its guard rail or guarding face, measured across the track at right angles to the gage line, [2] may not be less than—	Guard face gage — The distance between guard lines, [1] measured across the track at right angles to the gage line, [2] may not be more than—
1	4' 6⅛"	4' 5¼"
2	4' 6¼"	4' 5⅛"
3, 4	4' 6⅜"	4' 5⅛"
5, 6	4' 6½"	4' 5"

[1] A line along that side of the flangeway which is nearer to the center of the track and at the same elevation as the gage line.

[2] A line ⅝ inch below the top of the center line of the head of the running rail, or corresponding location of the tread portion of the track structure.

Subpart E—Track Appliances and Track-Related Devices

§ 213.201 Scope.

This subpart prescribes minimum requirements for certain track appliances and track-related devices.

§ 213.205 Derails.

(a) Each derail must be clearly visible. When in a locked position a derail must be free of any lost motion which would allow it to be operated without removing the lock.

(b) When the lever of a remotely controlled derail is operated and latched it must actuate the derail.

§ 213.207 Switch heaters.

The operation of a switch heater must not interfere with the proper operation of the switch or otherwise jeopardize the safety of railroad equipment.

Subpart F—Inspection

§ 213.231 Scope.

This subpart prescribes requirements for the frequency and manner of inspecting track to detect deviations from the standards prescribed in this part.

§ 213.233 Track inspections.

(a) All track must be inspected in accordance with the schedule prescribed in paragraph (c) of this section by a person designated under § 213.7.

(b) Each inspection must be made on foot or by riding over the track in a vehicle at a speed that allows the person making the inspection to visually inspect the track structure for compliance with this part. However, mechanical or electrical inspection devices approved by the Federal Railroad Administrator may be used to supplement visual inspection. If a vehicle is used for visual inspection, the speed of the vehicle may not be more than 5 miles per hour when passing over track crossings, highway crossings, or switches.

(c) Each track inspection must be made in accordance with the following schedule:

Class of track	Type of track	Required frequency
1, 2, 3	Main track and sidings.	*Weekly* with at least 3 calendar days interval between inspections, or *before use*, if the track is used less than once a week, or *twice weekly* with at least 1 calendar day interval between inspections, if the track carries passenger trains or more than 10 million gross tons of traffic during the preceding calendar year.
1, 2, 3	Other than main track and sidings.	*Monthly* with at least 20 calendar days interval between inspections.
4, 5, 6		*Twice weekly* with at least 1 calendar day interval between inspections.

(d) If the person making the inspection finds a deviation from the requirements of this part, he shall immediately initiate remedial action.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.235 Switch and track crossing inspections.

(a) Except as provided in paragraph (b) of this section, each switch and track crossing must be inspected on foot at least monthly.

(b) In the case of track that is used less than once a month, each switch and track crossing must be inspected on foot before it is used.

§ 213.237 Inspection of rail.

(a) In addition to the track inspections required by § 213.233, at least once a

year a continuous search for internal defects must be made of all jointed and welded rails in Classes 4 through 6 track, and Class 3 track over which passenger trains operate. However, in the case of a new rail, if before installation or within 6 months thereafter it is inductively or ultrasonically inspected over its entire length and all defects are removed, the next continuous search for internal defects need not be made until 3 years after that inspection.

(b) Inspection equipment must be capable of detecting defects between joint bars, in the area enclosed by joint bars.

(c) Each defective rail must be marked with a highly visible marking on both sides of the web and base.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.239 Special inspections.

In the event of fire, flood, severe storm, or other occurrence which might have damaged track structure, a special inspection must be made of the track involved as soon as possible after the occurrence.

§ 213.241 Inspection records.

(a) Each owner of track to which this part applies shall keep a record of each inspection required to be performed on that track under this subpart.

(b) Each record of an inspection under §§ 213.233 and 213.235 shall be prepared on the day the inspection is made and signed by the person making the inspection. Records must specify the track inspected, date of inspection, location and nature of any deviation from the requirements of this part, and the remedial action taken by the person making the inspection. The owner shall retain each record at its division headquarters for at least 1 year after the inspection covered by the record

(c) Rail inspection records must specify the date of inspection, the location, and nature of any internal rail defects found, and the remedial action taken and the date thereof. The owner shall retain a rail inspection record for at least 2 years after the inspection and for 1 year after remedial action is taken.

(d) Each owner required to keep inspection records under this section shall make those records available for inspection and copying by the Federal Railroad Administrator.

Appendix A—Maximum Allowable Operating Speeds for Curved Track

Degree of Curvature	Elevation of outer rail (inches): 0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
	Maximum allowable operating speed (mph)												
0°30′	93	100	107										
0°40′	80	87	93	98	103	109							
0°50′	72	78	83	88	93	97	101	106	110				
1°00′	66	71	76	80	85	89	93	96	100	104	107	110	
1°15′	59	63	68	72	76	79	83	86	89	93	96	99	101
1°30′	54	58	62	66	69	72	76	79	82	85	87	90	93
1°45′	50	54	57	61	64	67	70	73	76	78	81	83	86
2°00′	46	50	54	57	60	63	66	68	71	73	76	78	80
2°15′	44	47	50	54	56	59	62	64	67	69	71	74	76
2°30′	41	45	48	51	54	55	59	61	63	66	68	70	72
2°45′	40	43	46	48	51	54	56	58	60	62	65	60	68
3°00′	38	41	44	46	49	51	54	56	58	60	62	64	66
3°15′	36	39	42	45	47	49	51	54	56	57	59	61	63
3°30′	35	38	40	43	45	47	50	52	54	58	57	59	61
3°45′	34	37	39	41	44	46	48	50	52	54	55	57	59
4°00′	33	35	38	40	42	44	46	48	50	52	54	55	57
4°30′	31	33	36	38	40	42	44	45	47	49	50	52	54
5°00′	29	32	34	36	38	40	41	43	45	46	48	49	51
5°30′	28	30	32	34	36	38	40	41	43	44	46	47	48
6°00′	27	29	31	33	35	36	38	39	41	42	44	45	46
6°30′	26	28	30	31	33	35	36	38	39	41	42	43	45
7°00′	25	27	29	30	32	34	35	36	38	39	40	42	43
8°00′	23	25	27	28	30	31	33	34	35	37	38	39	40
9°00′	22	24	25	27	28	30	31	32	33	35	36	37	38
10°00′	21	22	24	25	27	28	29	31	32	33	34	35	36
11°00′	20	21	23	24	26	27	28	29	30	31	32	33	34
12°00′	19	20	22	23	24	26	27	28	29	30	31	32	3

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

APPENDIX B

PROPOSED RAIL OUTLOADING PROCEDURE FOR A MOBILIZATION MOVE AT FORT DEVENS

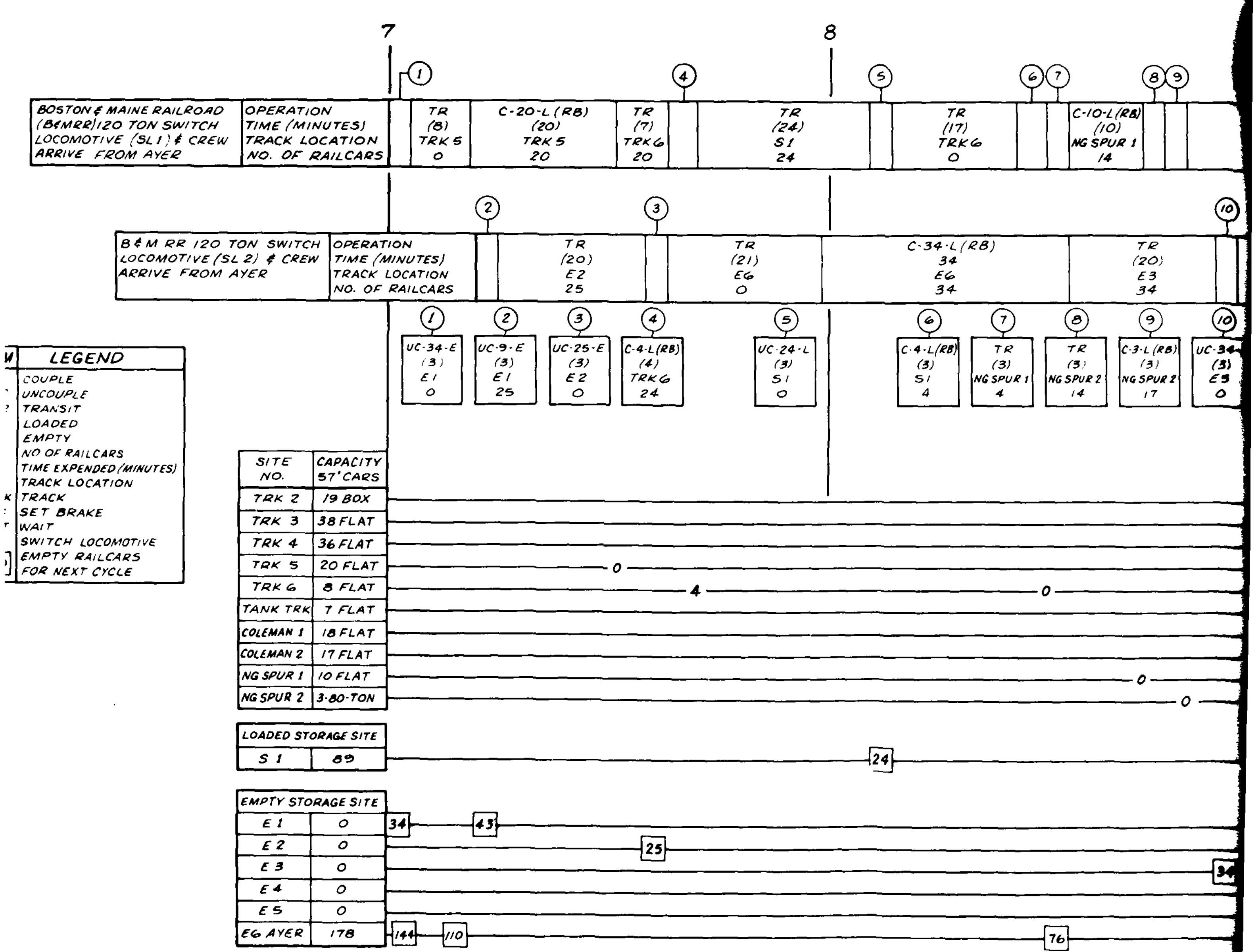
Maximum rail operations use a cyclic schedule to minimize conflicts and improve control. The recommended rail outloading plan, Plan 4, is for ports of embarkation that are farther than 800 miles from the installation and is shown in figure 42. Plan 4 assumes that 176 railcars per day will be outloaded from Fort Devens.

The simulation begins with the assumption that it takes several days to accumulate the necessary number of railcars to start full-scale outloading operations. The empty cars are positioned at designated loading sites according to a preconceived plan. Simultaneously, the equipment to be loaded aboard the cars is prepared and staged. The cycle starts when loading begins at daylight, which is defined as zero hour.

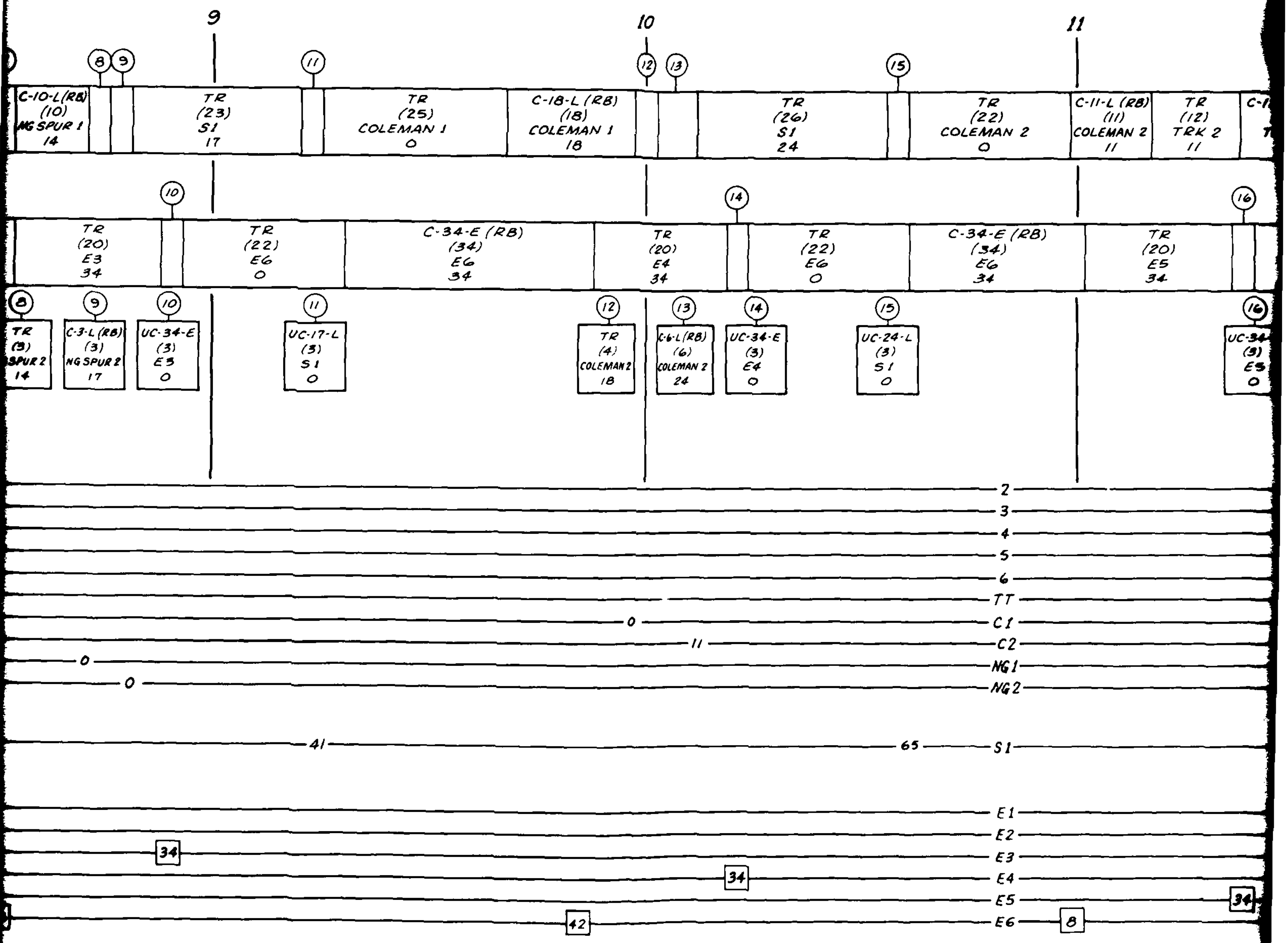
Loading and blocking and bracing of equipment onto empty cars at the loading sites will be accomplished during daylight hours and is expected to last about 7 hours. The railcar switching operations will follow and must be finished in 17 hours so that the next cycle can begin the following day. That is, the loaded cars must be removed, assembled into trains, and sent toward their destination, and empty cars must be placed at the loading sites before daylight the next morning. Personnel should be used to throw switches and act as roadguards at all rail/highway crossings to reduce delay and insure a safe operation. The detailed switching sequence (fig 42) is described herewith.

Initial conditions--empty railcars have been accumulating for several days and have been spotted at all loading sites. The number of railcars in position is 176, and the general operation plan is that the previously mentioned loading sites will be used for loading on a cyclic basis. No incoming loaded railcars are expected during peak outloading. However, should additional railcars arrive, they should be spotted on BM track at the Fort Devens marshalling yard.

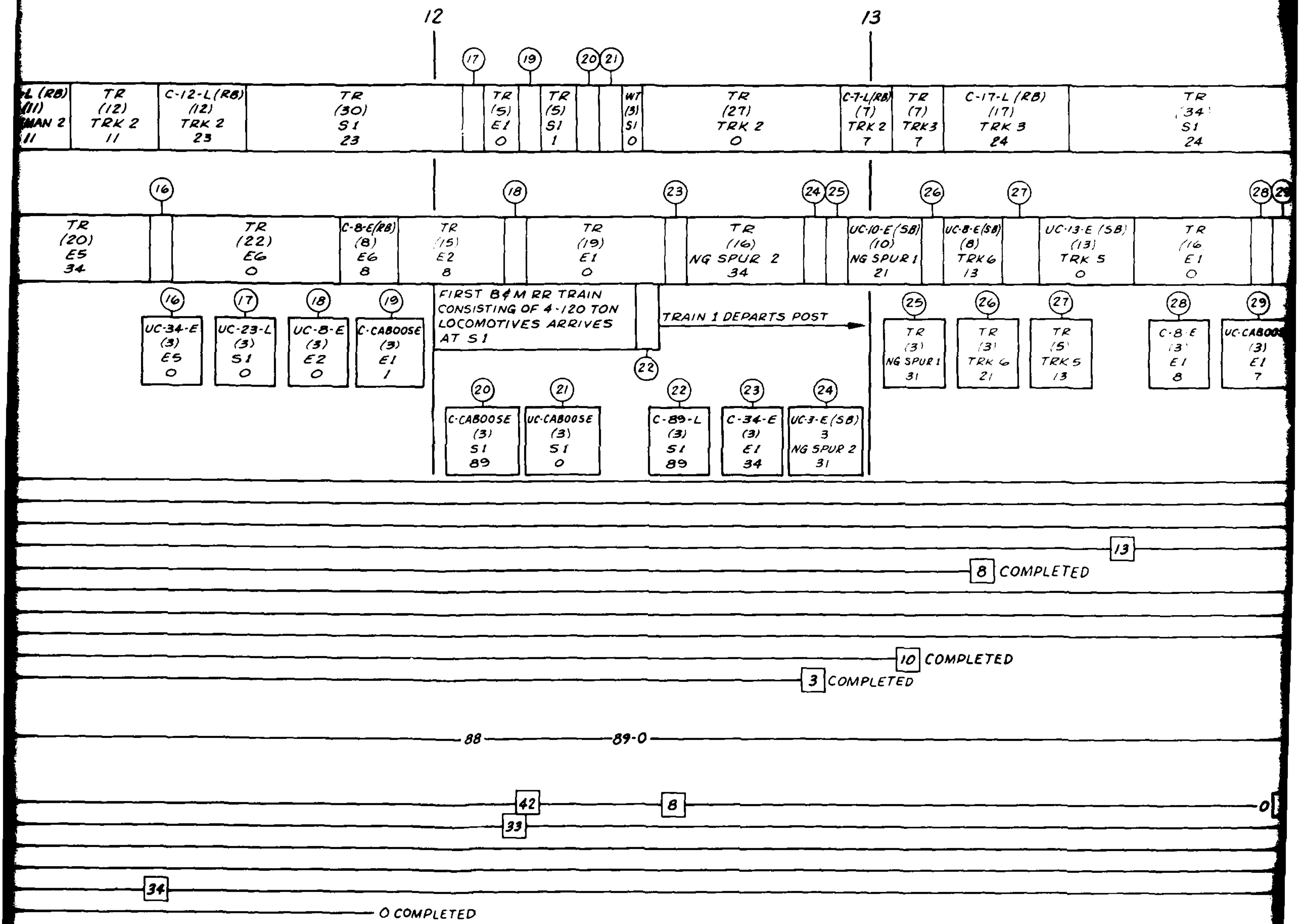
When the unit equipment is loaded onto the railcars, one BM 120-ton switch locomotive (SL 1) from Ayer will begin coupling railcars to form the respective trainloads, while a second BM 120-ton switch locomotive (SL 2) will bring empty railcars from E6 at Ayer and leave them at E1 through E5 (empty storage sites), located at the Fort Devens marshalling yard. SL 2 will also replace vacated loading sites with empty railcars ready to be loaded. There will be two outgoing trains per 24-hour period for 10 days. Each train will consist of 88 railcar loads of equipment and a caboose.



7
8
BOSTON & MAINE RAILROAD (B&MRR) 120 TON SWITCH LOCOMOTIVE (SL 1) & CREW ARRIVE FROM AYER
OPERATION
TIME (MINUTES)
TRACK LOCATION
NO. OF RAILCARS
TR (8) TRK 5 0
C-20-L (RB) (20) TRK 5 20
TR (7) TRK 6 20
TR (24) S 1 24
TR (17) TRK 6 0
C-10-L (RB) (10) NG SPUR 1 14
B & M RR 120 TON SWITCH LOCOMOTIVE (SL 2) & CREW ARRIVE FROM AYER
OPERATION
TIME (MINUTES)
TRACK LOCATION
NO. OF RAILCARS
TR (20) E 2 25
TR (21) E6 0
C-34-L (RB) 34 E6 34
TR (20) E 3 34
UC-34-E (3) E 1 0
UC-9-E (3) E 1 25
UC-25-E (3) E 2 0
C-4-L (RB) (4) TRK 6 24
UC-24-L (3) S 1 0
C-4-L (RB) (3) S 1 4
TR (3) NG SPUR 1 4
TR (3) NG SPUR 2 14
C-3-L (RB) (3) NG SPUR 2 17
UC-34 (3) E 3 0
LEGEND
COUPLE
UNCOUPLE
TRANSIT
LOADED
EMPTY
NO OF RAILCARS
TIME EXPENDED (MINUTES)
TRACK LOCATION
TRACK
SET BRAKE
WAIT
SWITCH LOCOMOTIVE
EMPTY RAILCARS FOR NEXT CYCLE
SITE NO.
CAPACITY 57' CARS
TRK 2 19 BOX
TRK 3 38 FLAT
TRK 4 36 FLAT
TRK 5 20 FLAT
TRK 6 8 FLAT
TANK TRK 7 FLAT
COLEMAN 1 18 FLAT
COLEMAN 2 17 FLAT
NG SPUR 1 10 FLAT
NG SPUR 2 3-80-TON
LOADED STORAGE SITE
S 1 89
EMPTY STORAGE SITE
E 1 0
E 2 0
E 3 0
E 4 0
E 5 0
E6 AYER 178



9
10
11
C-10-L (RB) (10) NG SPUR 1 14
TR (23) S1 17
TR (25) COLEMAN 1 0
C-18-L (RB) (18) COLEMAN 1 18
TR (26) S1 24
TR (22) COLEMAN 2 0
C-11-L (RB) (11) COLEMAN 2 11
TR (12) TRK 2 11
TR (20) E3 34
TR (22) E6 0
C-34-E (RB) (34) E6 34
TR (20) E4 34
TR (22) E6 0
C-34-E (RB) (34) E6 34
TR (20) E5 34
TR (3) SPUR 2 14
C-3-L (RB) (3) NG SPUR 2 17
UC-34-E (3) E3 0
UC-17-L (3) S1 0
TR (4) COLEMAN 2 18
C-6-L (RB) (6) COLEMAN 2 24
UC-34-E (3) E4 0
UC-24-L (3) S1 0
UC-34 (3) E5 0
2
3
4
5
6
TT
0 C1
11 C2
0 NG1
0 NG2
41 65 S1
E1
E2
34 E3
34 E4
E5 34
42 E6 8


12
13
TR (12) TRK 2 11
C-12-L (RB) (12) TRK 2 23
TR (30) S1 23
TR (5) E1 0
TR (5) S1 1
WT (3) S1 0
TR (27) TRK 2 0
C-7-L (RB) (7) TRK 2 7
TR (7) TRK 3 7
C-17-L (RB) (17) TRK 3 24
TR (34) S1 24
TR (20) E5 34
TR (22) E6 0
C-8-E (RB) (8) E6 8
TR (15) E2 8
TR (19) E1 0
TR (16) NG SPUR 2 34
UC-10-E (SB) (10) NG SPUR 1 21
UC-8-E (SB) (8) TRK 6 13
UC-13-E (SB) (13) TRK 5 0
TR (16) E1 0
UC-34-E (3) E5 0
UC-23-L (3) S1 0
UC-8-E (3) E2 0
C-CABOOSE (3) E1 1
FIRST B&M RR TRAIN CONSISTING OF 4-120 TON LOCOMOTIVES ARRIVES AT S1
TRAIN 1 DEPARTS POST
TR (3) NG SPUR 1 31
TR (3) TRK 6 21
TR (5) TRK 5 13
C-8-E (3) E1 8
UC-CABOOSE (3) E1 7
C-CABOOSE (3) S1 89
UC-CABOOSE (3) S1 0
C-89-L (3) S1 89
C-34-E (3) E1 34
UC-3-E (SB) 3 NG SPUR 2 31
13
8 COMPLETED
10 COMPLETED
3 COMPLETED
88
89-0
42
8
0
33
34
0 COMPLETED

13

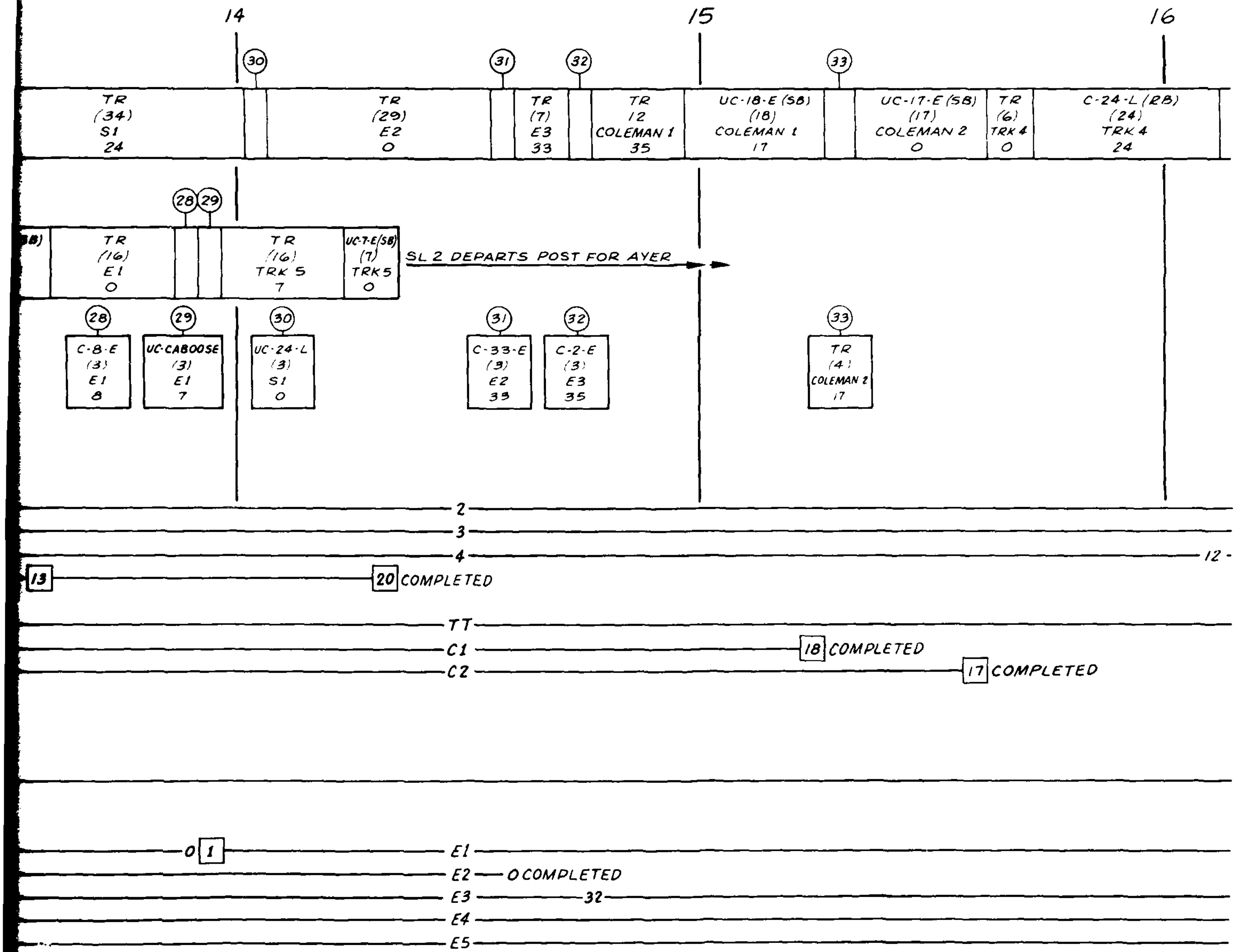


Figure 42. Rail outloading simulation, Plan 4.

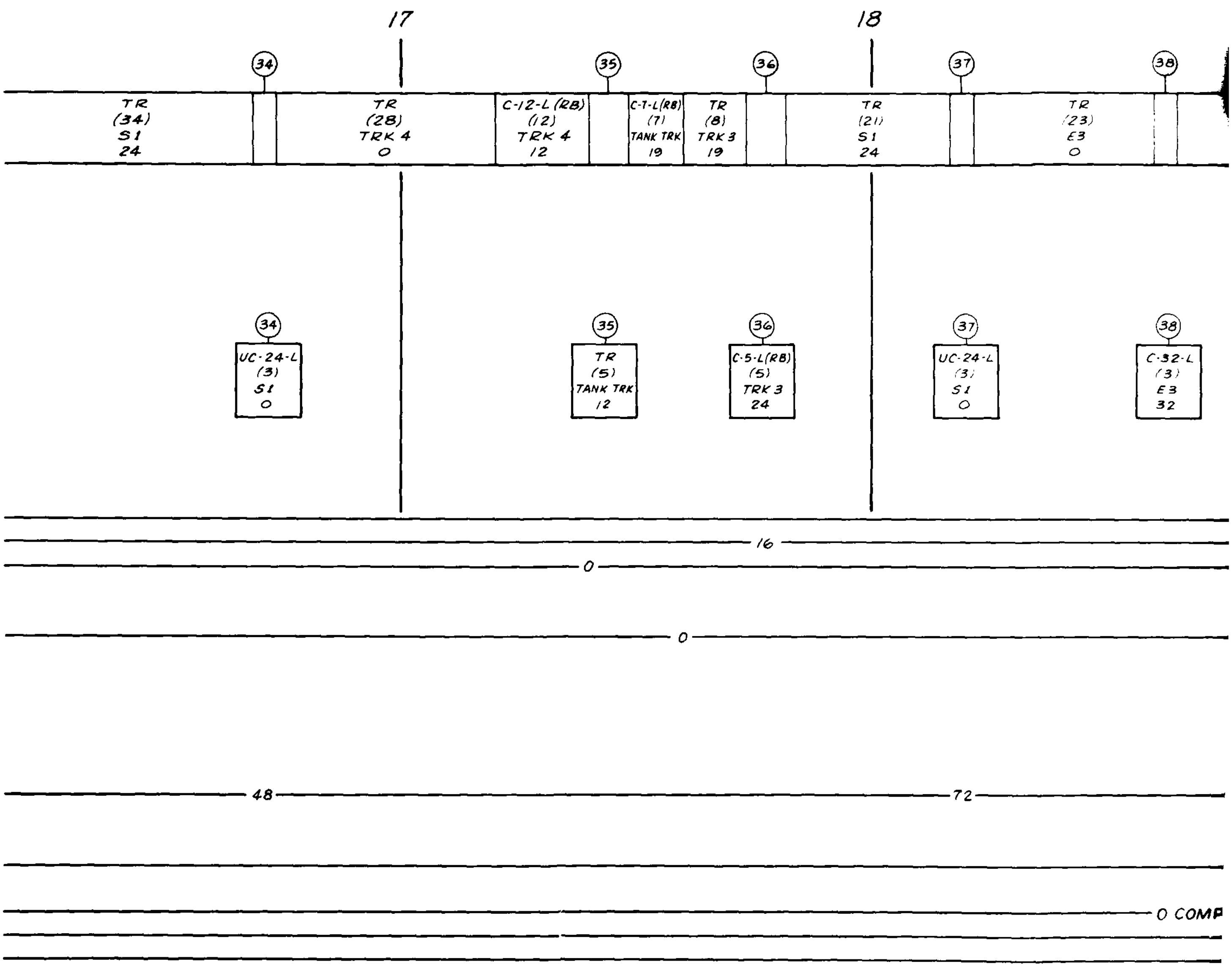
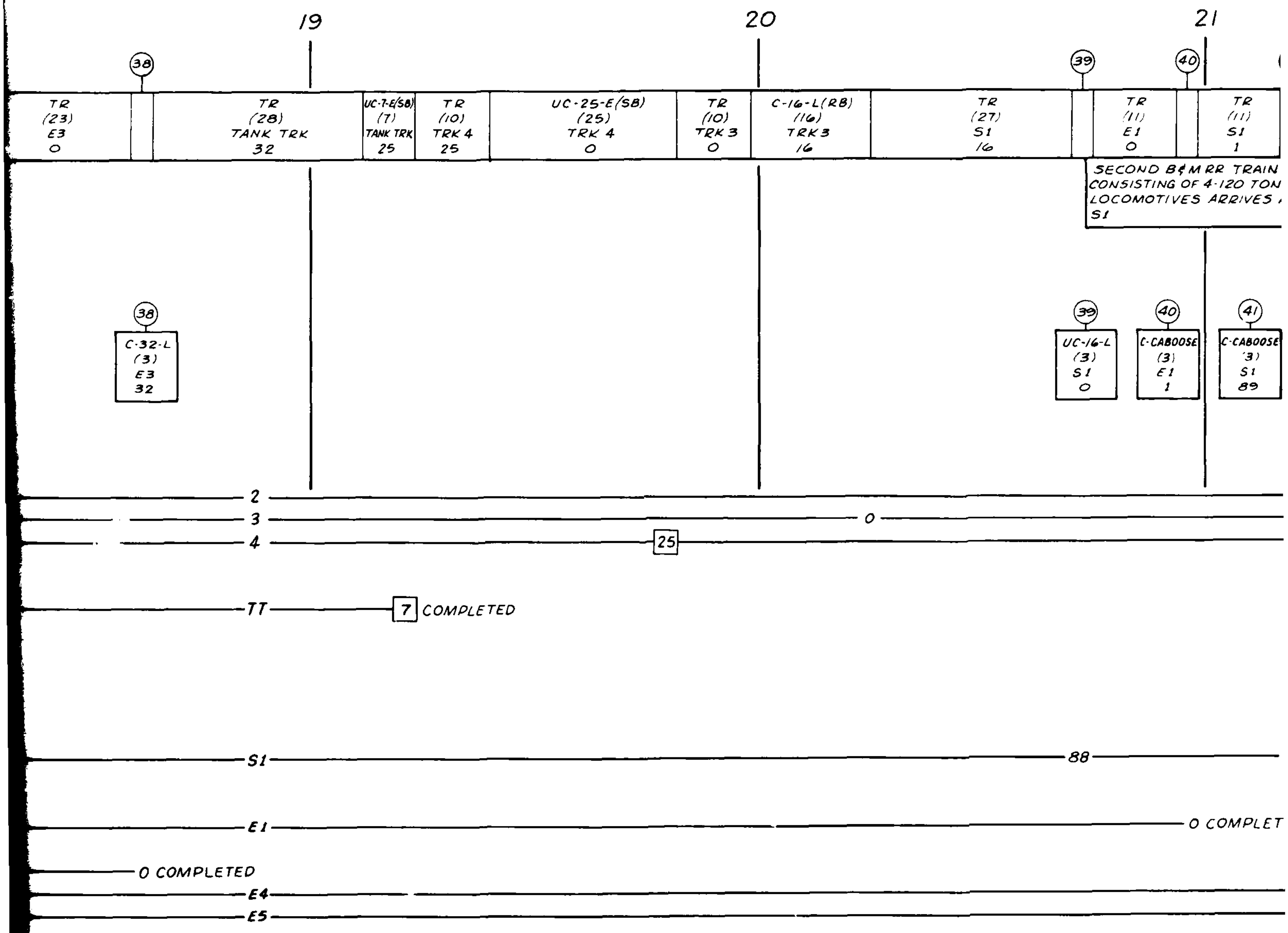


Figure 42. Continued.


19
20
21
38
TR (23) E3 0
TR (28) TANK TRK 32
UC-7-E(SB) (7) TANK TRK 25
TR (10) TRK 4 25
UC-25-E(SB) (25) TRK 4 0
TR (10) TRK 3 0
C-16-L(RB) (16) TRK3 16
TR (27) S1 16
39
TR (11) E1 0
40
TR (11) S1 1
SECOND B&M RR TRAIN CONSISTING OF 4-120 TON LOCOMOTIVES ARRIVES / S1
38
C-32-L (3) E3 32
39
UC-16-L (3) S1 0
40
C-CABOOSE (3) E1 1
41
C-CABOOSE (3) S1 89
2
3
0
4
25
TT
7 COMPLETED
S1
88
E1
0 COMPLET
0 COMPLETED
E4
E5

AD-A101 765 MILITARY TRAFFIC MANAGEMENT COMMAND TRANSPORTATION EN--ETC F/G 15/5
RAIL AND MOTOR OUTLOADING CAPABILITY STUDY. FORT DEVENS, MASSAC--ETC(U)
MAR 80 N J MACLEOD
UNCLASSIFIED MTMC-TE-79-4-54 SBIE-AD-E750 083 NL

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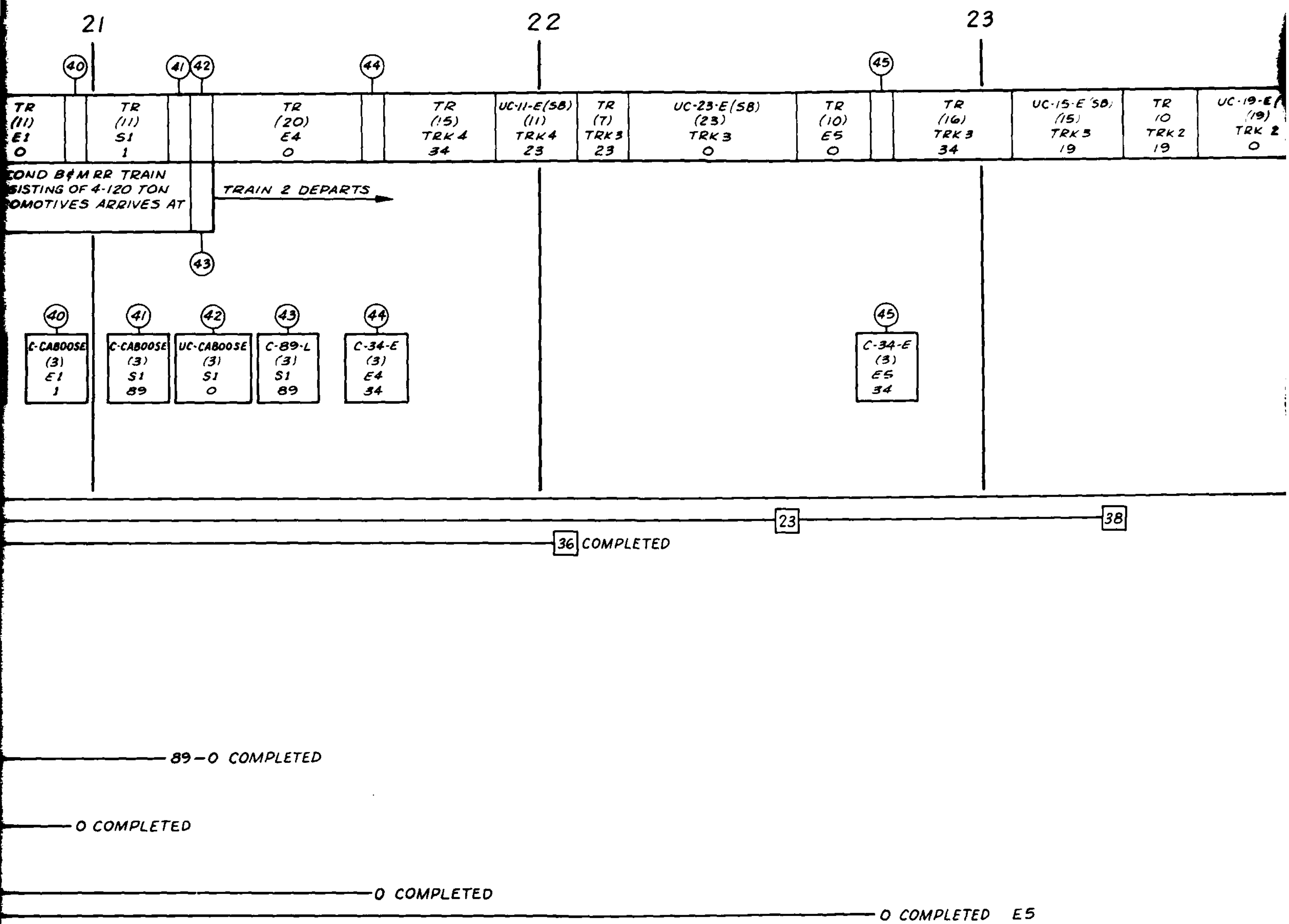
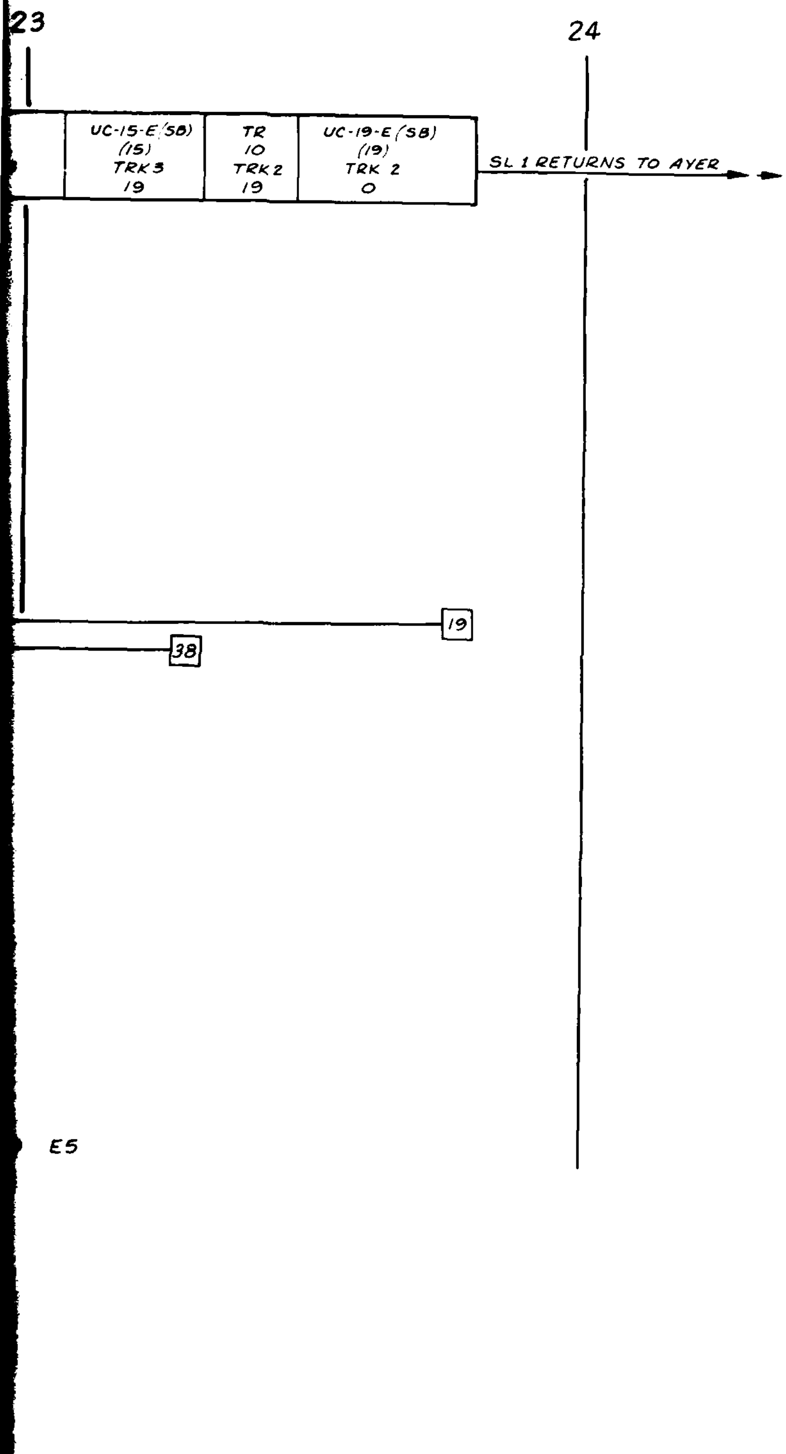


21
22
23
40
41
42
44
45
TR (11) E1 0
TR (11) S1 1
TR (20) E4 0
TR (15) TRK 4 34
UC-11-E(SB) (11) TRK 4 23
TR (7) TRK 3 23
UC-23-E(SB) (23) TRK 3 0
TR (10) E5 0
TR (16) TRK 3 34
UC-15-E(SB) (15) TRK 3 19
TR 10 TRK 2 19
UC-19-E((19) TRK 2 0
COND B&M RR TRAIN
SISTING OF 4-120 TON
OMOTIVES ARRIVES AT
TRAIN 2 DEPARTS
43
C-CABOOSE (3) E1 1
C-CABOOSE (3) S1 89
UC-CABOOSE (3) S1 0
C-89-L (3) S1 89
C-34-E (3) E4 34
C-34-E (3) E5 34
23
38
36 COMPLETED
89—0 COMPLETED
0 COMPLETED
0 COMPLETED
0 COMPLETED E5



23
24
UC-15-E (SB)
(15)
TRK 3
19
TR
10
TRK 2
19
UC-19-E (SB)
(19)
TRK 2
0
SL 1 RETURNS TO AYER
19
38
E5

4

The switching sequence begins at the conclusion of the blocking and bracing and inspection, which is 7 hours elapsed time from the beginning of the cycle.

SL 1 couples with, in the following order: three 80-ton flats, thirty 57-foot flats, and a caboose at Ayer E6 (empty railcar storage site). SL 1 pulls the 34 empty cars off E6, traveling south on the BM passing track, entering E1, and stopping 200 feet north of the BM crossover switch. SL 1 now uncouples from the cars, leaving the string at E1. SL 1 proceeds south on passing track 2 until it clears the crossover track switch; at this point it stops, reverses direction, enters the BM lead track, and, traveling over the commissary track, reaches track 5, where it couples with 20 loaded flatcars.

SL 1 backs south out of track 5, pulling the loaded flats onto the commissary track until the last car clears the track 5/track 6 switch; then it reverses direction, pushing the string of cars onto track 6, where it couples with and releases the brakes on four additonal loaded flats.

Now, SL 1 backs out of track 6, pulling the 24-car string onto the commissary track, the BM lead track, and south on passing track 1. After the last car of SL 1 clears passing track 1 and the BM lead track switch, the train reverses direction and travels north on passing track 1 until the lead car is 1,525 feet north of the passing track north switch. Here it uncouples from the cars.

While SL 1 is at track 5 (loading site), SL 2 is at Ayer E6, where it couples with 25 empty flats, a caboose, and 8 more empty flatcars, in that order. SL 2 pulls the 34 cars south on passing track 1 and, using the BM crossover track, enters passing track 2. After the end car of SL 2 clears the crossover switch, the train reverses direction, pushing the string north on passing track 2 until the lead car couples with the 33 empty flats and a caboose which were placed there earlier by SL 1. SL 2 uncouples from the caboose and eight additional empty flats, leaving E1 now with a caboose, three 80-ton flats, thirty-eight 57-foot flats, and a caboose on the end of the string. The 41 empty flats stored on E1 will be placed at tracks 5 and 6 and NG spurs 1 and 2 (loading sites), filling the empty car replacement quota at Fort Devens east area. A caboose will be placed on the rear of each departing 88-car loaded train.

SL 2 backs the 25 empty flats off E1 and continues south on passing track 2 until it clears the south switch; then it reverses direction and now, traveling north on the BM main line, places the cars at E2.

SL 2 makes four additional trips to Ayer E6, where it picks up empty cars and delivers them to the Fort Devens marshalling yard. Here, the cars are readily available to be shuttled into vacated loading sites in the post west area. SL 2 uses the BM main line track to pull the empty cars between Ayer and the marshalling yard. It places 34 empty flatcars on E3, 34 empty flatcars on E4, and 19 boxcars and 15 flatcars on E5. At E2, it couples 8 additional flats with the 25 empty cars there. This last action of SL 2 completes a 24-hour empty car replacement quota at the post marshalling yard.

SL 2's next move is to remove the empty cars from E1 and place them at the vacated loading sites in the post east area. However, before going into this point of the narrative, it is necessary to go back to the SL 1 operation, pick it up, advance, and coordinate the first switch locomotive with the SL 2 action.

So, while SL 2 is loading the empty storage sites with railcars, SL 1, in building the first POE train, has placed 24 loaded flatcars at S1. SL 1 then backs south on passing track 1 until it reaches the BM lead track switch. Now it reverses direction and, using the BM lead track and the commissary track, it travels to E6 and couples with the remaining four loaded flatcars. Releasing the brakes on the four flats, SL 1 pushes the cars north on the NG lead track and then to the NG spur 1 track, where it picks up 10 more loaded flats. SL 1 backs off the NG spur 1 track with 14 cars and continues south on the NG lead track until the end car clears the NG spurs 1 and 2 track switch, where, reversing direction, it pushes the loaded cars onto NG spur 2 track until they couple with three 80-ton loaded flats. After releasing brakes on the 80-ton cars, SL 1, now pulling 17 loaded flats, travels south on the NG lead track and, using the commissary track and the BM lead track, backs out onto passing track 1. After the end car clears passing track 1 and the BM Railroad switch, SL 1 reverses direction and, traveling north on passing track 1, pushes the 17 loaded flats onto S1 where they are coupled with the 24 loaded railcars placed there earlier. SL 1 uncouples from the cars, travels south on passing track 1, and uses the BM crossover track to passing track 2, where it continues south until clearing the south switch. SL 1 stops after clearing the south switch, reverses direction, and now, moving north on the BM main line track, enters the post lead track, then onto Coleman track 1, where it couples with 18 loaded flatcars. SL 1 and the 18 cars travel to Coleman track 2, where six more loaded flats are coupled, making a train of 24 cars.

Departing Coleman track 2, SL 1 pulls the cars south on the post lead track, enters the BM main line track until the end car clears the south switch; here, the train reverses direction, moving north, pushing the 24 loaded

flatcars over passing track 2, then onto the BM crossover track to passing track 1, where the cars are moved to S1 and coupled with the waiting 41 flats.

With 65 loaded railcars on S1, SL 1 returns to the post west area for the 11 remaining flatcars on Coleman track 2, then moves to track 2 for 12 loaded boxcars. Now, SL 1 travels back to S1, where it couples the 22 cars with the waiting string, making an 88-car loaded train.

SL 1 backs off S1 and uses the BM Railroad crossover track to passing track 2; then, reversing direction, the switch locomotive travels north on passing track 2 to E1 where it couples with the caboose placed there earlier by SL 2. SL 1 pulls the caboose south out of E1 onto passing track 2 and returns to S1, coupling it to the end car.

As SL 1 was adding the caboose at S1, four 120-ton road locomotives from Ayer entered E1 and coupled with the 89 railcars. When SL 1 uncoupled from the caboose, the locomotives, pulling train 1, departed the post.

Meanwhile, SL 2 places eight additional empty cars at E2 and then travels to E1, where it couples with 34 empty flatcars. SL 2 backs south out of E1 onto passing track 2 and, when the end car clears the BM crossover track, it reverses direction, pushing the train onto the BM lead track; then, traveling over the commissary track to track 5 and the NG lead track, SL 2 places, and sets the brakes on, three 80-ton flats at NG spur 2. SL 2 pulls the remaining 31 empty flats off NG spur 2 until the end car clears NG spurs 2 and 1 track; then, reversing direction, it pushes 10 empty flatcars onto NG spur 1. SL 2 sets the brakes on the 10 cars, uncouples from the last car, and backs off NG spur 1 onto the NG lead track; then, traveling over track 6, it stops, sets brakes on, uncouples from, and leaves eight empty flatcars. Towing 13 empty cars south off track 6 onto the commissary track and after clearing the track 6/track 5 south switch, SL 2 reverses direction, pushing the cars north onto track 5. The switch locomotive sets the brakes on, and uncouples from, the 13 empty flats and returns to E1.

At E1, SL 2 couples with a string of seven remaining flatcars and a caboose. The caboose must remain available for train 2, so it is uncoupled from the flatcars and remains at E1 until later.

SL 2 returns to track 5 with the seven empty flats and couples them with the 13 cars already at the site. After the brakes are set on the string, SL 2 uncouples from the cars and returns to Ayer to wait for the next day's cycle.

Now the switching operation returns to S1, where SL 1 has built train 1 and, after coupling the caboose onto the last car, the switch locomotive uncouples from the caboose, waits for 3 minutes, and returns to track 2.

SL 1 couples with and removes the remaining seven loaded flatcars from track 2, then transits to track 3 and picks up 17 additional loaded cars.

SL 1, with a 24-loaded-car train, backs south off track 3 onto the post lead track, transits the BM main line track, where, when the last car clears the south switch, the train reverses direction and, now headed north on passing track 2, uses the BM crossover track and passing track 1 to enter the north end of S1. SL 1 places the 24 loaded flats 1,525 feet north of the BM passing track north switch.

SL 1 uncouples from the 24 loaded cars at S1 and transits to E2 and E3, where it picks up 33 and 2 empty railcars, respectively, from the empty car storage sites.

SL 1 removes the 35 empty cars from the empty car storage area and transits them first to Coleman 1, where it uncouples from and sets brakes on 18 empty flatcars. The next move is to Coleman 2, where the same maneuver is completed on the remaining 17 empty flatcars.

SL 1 has completed a railcar loading cycle at Coleman 1 and 2 sites, and the Fort Devens west area switching action is in progress.

Switch locomotive 1 works on the west area loading sites, repeating the transit switching action, by shuttling loaded railcars from loading site tracks 2, 3, and 4 to the loaded storage site until an 88-car train is formed at S1. On each trip to the west area, SL 1 makes a stop at empty car storage sites E3, E4, and E5 and picks up a train of empty railcars that are placed at the vacated tank storage track and at loaded storage site tracks 4, 3, and 2.

After an 88-car train is built at S1, SL 1 picks up the last caboose on E1 and couples it with the end car. As SL 1 is coupling the caboose to the train, four 120-ton road locomotives arrive at S1 from Ayer and couple to the loaded cars. SL 1 uncouples from the caboose, and train 2 departs for Ayer.

After train 1 departs, SL 2 continues filling the west area loading sites with empty railcars, finalizing the operation by placing 19 empty boxcars at track 2.

As SL 1 departs for Ayer, a complete rail-switching cycle required 16 hours 39 minutes. During this period, 157 57-foot flatcars, 19 boxcars, and 2 cabooses were picked up, assembled into two 89-railcar trains, and moved out of the area. Empty cars were repositioned at the 10 loading sites.

Fort Devens has a total outloading quota of 1,822 57-foot flatcars (included are three 80-ton flatcars), and 57 boxcars. Using the selected loading sites of Plan 4, the 1,879 railcars can be outloaded in 10 days.

All sites except track 2 will load the designated railcar capacity throughout the 10-day loading period. Track 2 loading site will vary, whereas, for the first three loading days, 19 boxcars will be outloaded and 19 empty boxcars brought in to be loaded, filling a total 57-boxcar quota for the installation. Then, for the remaining seven loading days, track 2 will outload 36 flatcars per day.

The times required for various railcar switching operations are shown in table 11.

TABLE 11
TIMES REQUIRED FOR VARIOUS RAILCAR SWITCHING
OPERATIONS AND LOCOMOTIVE CAPABILITY

Empty

C-15-E (5 min)
C-30-E (10 min)
C-45-E (15 min)
UC-15-E (1-2 min)
UC-15-E (SB) (15 min)
UC-30-E (SB) (30 min)

Loaded

C-15-L (5 min)
C-30-L (10 min)
C-45-L (15 min)
But if cars have been sitting overnight
brakes must be checked
C-15-L (RB) (15 min)
C-30-L (RB) (30 min) (or 15 min for 2 men)
C-45-L (RB) (45 min) (or 15 min for 3 men)
UC-15-L (1-2 min)
UC-15-L (SB) (15 min)
UC-30-L (SB) (30 min)

C = Couple
UC = Uncouple
E = Empty
L = Loaded
SB = Set Brakes
Set brakes if cars are to be left overnight or loaded or on a steep grade.
RB = Release Brakes
UC-15-E(SB) = Uncouple 15 empty railcars, set brakes.

Note:
Above times are for daylight operations; add 5 minutes for night operations if brakes have to be set or checked.

TRANSIT SPEED

Average for all switching operations, 5 miles per hour. Engine with no railcars, 10 miles per hour for distances of one-half mile or more (except for nighttime, then add 5 minutes for each transit).

LOCOMOTIVE CAPABILITY

120-ton locomotive--1,200 tons on 2.5% grade
Empties--34 cars
Loaded--24 cars
2 M-60 tanks on series 38 car, 9 cars per locomotive
16 cars per locomotive with 1 tank per can
2 locomotives--2 times above capabilities

Speed vs Time

@5 miles per hour = .00227 min/ft
@10 miles per hour = .00114 min/ft
@26 miles per hour = .000438 min/ft

APPENDIX C

SPECIAL-PURPOSE RAILCARS AND LOADING/UNLOADING PROCEDURES

Specially designed railcars, in particular those used for transporting vehicles, can greatly increase the speed and efficiency of a rail outloading operation. Bilevel and integral chain tiedown flatcars are the primary means of enhancing the loadout routine of most military vehicles. Bilevel railcars are best suited for the smaller vehicles, including 2-1/2-ton trucks. Although trilevel cars are in abundant supply, their relatively low deck clearances prohibit the movement of most military equipment and, therefore, cannot be considered a significant resource.

The integral tiedown flatcars will accommodate larger vehicles, including tanks. Loading and securing equipment on these railcars can be accelerated to 15 minutes per vehicle, for small vehicles, versus approximately 45 minutes for blocking and bracing procedures used on standard-type railcars. Also, the BTTX 89-foot flatcar has a capacity of six 2-1/2-ton trucks, doubling the single-level capacity. Thus, in speed and capacity, special-purpose railcars are an advantage worth investigating.

There are essentially five methods of loading/unloading multilevel railcars, they are:

1. The "K" loader of 463L aircraft cargo-loading system.

2. The forklift and pallet used in conjunction with a crane and/or ramp.

3. The crane and ramp combination.

4. Adjustable ramps.

5. Adjustable built-in ramp on multilevel railcars.

The procedures used with each of the above are described in detail in TM 55-625[9/], as are tiedown procedures.

[9/] TM 55-625, Transportability Criteria and Guidance, Loading and Unloading Multilevel Railcars at Military Installations in the United States.

As of 1970, more than 70 percent of DOD installations had no organic capability to load/unload multilevel railcars. No outloading plans should include the use of these railcars until a thorough investigation verifies their availability at the time required. The supply of special-purpose flatcars with integral tiedowns is also limited. As a result, even though these types of railcars are very valuable for volume rail outloading operations, their availability is seriously in question unless advance preparations are made.

The following trends in flatcar supply are now operative and have been since the development of modern piggyback service in the mid-1950's:

1. The size of the flatcar fleet has been growing, both in number of flatcars and in relation to the size of the car fleet as a whole. This gain has been confined to specialized cars; for example, trailer-on-flatcar, container-on-flatcar, bilevel, trilevel, and bulkhead flatcars.

2. The size of the general-purpose flatcar fleet has decreased, though average length and capacity have increased.

3. A majority of all flatcars are owned by car companies, not by the railroads. Therefore, more flexibility in assignment, with improved utilization, has resulted. Fewer idle cars are available for short-notice use than would be if each railroad maintained an adequate supply for its own needs.

Considering these trends, the sizes of the various components of the specialized flatcar fleet, and the blocking and bracing requirements for the various types of equipment to be shipped by rail, it does not appear prudent to express an installation's needs and outloading plan using only general-purpose flats. The TOFC fleet, in particular, is now most likely large enough to fill military requirements (table 12). The COFC fleet also has expanded to the point that it could carry most of the military's container movements, especially since COFC cars are used almost exclusively for import/export movements, which likely would be greatly disrupted in a mobilization period.

Accordingly, vans or containers should be outloaded on TOFC cars. If the movement is to a port for ocean shipment by other than RORO vessel, the use of COFC cars should be considered. However, the availability of COFC cars in the quantity desired without disrupting civilian container movements is highly improbable.

Other cars in the specialized flatcar fleet generally are assigned to specific services or to a carpool for one shipper's exclusive use. Therefore,

TABLE 12

TRAILER TRAIN COMPANY FLEET

Trailer Train Company ownership of selected car types as contained in the January 1979 Official Railway Equipment Register. Trailer Train owns in excess of 95 percent of total US ownership of TOFC, COFC, and autorack cars.

Type	Reporting Marks	Quantity	
Flatcars with special equipment. See Legend	ATTX	303	
	FTTX	1,839	
	HTTX	763	
	ITTX	1,164	
	JTTX	2,474	
	MTTX	1,239	
	OTTX	2,519	
	PTTX	926	
	TTDX	222	
	TTHX	391	
	TTJX	205	
	TTMX	21	
	TTPX	1,426	
	ZTTX	72	
		13,564	
TOFC	TTX	28,908	
	TTAX	6,874	(see also COFC)
	GTTX	2,251	
	LTTX	2,027	
	XTTX	702	
		40,762	
COFC	TTAX	6,874	(see also TOFC)
	TTCX	699	
		7,573	
Bilevels	BTTX	1,882	
	TTBX	5,720	
	TTGX	1,002	
	TTSX	8	
		8,612	
Trilevels	CTTX	1,002	
	ETTX	5,034	
	KTTX	1,160	
	RTTX	2,540	
	TTKX	6,703	
	TTRX	2,696	
		19,135	

RTTX	2,540
TTKX	6,703
TTRX	2,696
	19,135

Legend - Definitions of Trailer Train Company's reporting marks

ATTX - Flatcars, equipped with two continuous tiedown loops on center sills, continuous tiedown rails on each side, and bridgeplates. Not equipped with hitches, chains, jacks, and so forth.

BTTX - Flatcars equipped with bilevel autoracks, furnished by participant railroads.

CTTX - Flatcars equipped with coverless inclosed trilevel autoracks, furnished by participant railroads.

ETTX - Flatcars equipped with fully inclosed trilevel autoracks, furnished by participant railroads.

FTTX - Flatcars equipped with tiedown devices for loading automobile or truck frames.

GTTX - Flatcars equipped with hitches and bridgeplates for transporting trailers. Cars built by General American Transportation Corporation.

HTTX - Flatcars equipped with 38 heavy-duty chains, with snubbers and turnbuckles, each secured to movable and retractable tiedown winches in 4 longitudinal channels for transporting large, earth moving equipment.

ITTX - Flatcars equipped with end pedestals, and 62 tiedown winches with chains and bridgeplates, for transporting trailer tractors saddleback style.

JTTX - Flatcars specially modified or equipped by participant railroads with miscellaneous devices for special services.

KTTX - Flatcars equipped with hinged-end trilevel autoracks, furnished by participant railroads.

LTTX - Low-deck flatcars equipped with hitches and bridgeplates.

MTTX - Sixty-ft flatcars with stake pockets and lading strap anchors for general service, or 85-ft flatcars with 16 stake pockets, 8 per side, for transporting long pipe.

OTTX - Flatcars equipped with 64 chains, with snubbers, each secured to movable and retractable tiedown winches in 4 longitudinal channels, for transporting agricultural equipment.

PTTX - Flatcars equipped with bulkheads, spaced 48 ft 6 in. apart, for transporting plywood, wallboard, and so forth.

RTTX - Flatcars equipped with fixed trilevel autoracks, furnished by participant railroads.

TTAX - Flush deck flatcars equipped with movable foldaway container pedestals, knockdown hitches, and bridgeplates, for transporting trailers or containers or combinations of both.

TTBX - Flatcars equipped with bilevel autoracks, furnished by participant railroads.

TTCX - Flush deck flatcars equipped with movable foldaway container pedestals for transporting containers.

TTDX - Flatcars equipped with 16 tiedown winches with chains and bridgeplates, for transporting military vehicles semi-saddleback style.

TTGX - Flatcars equipped with fully inclosed bilevel autoracks, furnished by participant railroads.

TTHX - Flatcars equipped with heavy-duty chains anchored to removable stake pocket castings. When tie-downs are removed, car becomes same as 60-ft cars stencilled "MTTX."

TTJX - Sixty-eight-ft, 90-ton flatcars with special tiedown devices, fixtures, and stake pockets.

TTKX - Flatcars equipped with hinged-end trilevel autoracks, furnished by participant railroads.

TTMX - Sixty-eight-ft, 100-ton flatcars with stake pockets and lading strap anchors for general service.

TTPX - Flatcars equipped with bulkheads spaced 62 ft 0 in. apart and 17 transverse tiedown anchors with chains, used for transporting wallboard, plywood, and so forth.

TTRX - Flatcars equipped with fixed trilevel autoracks, furnished by participant railroads.

TTSX - Flatcars equipped with coverless inclosed bilevel autoracks, furnished by participant railroads.

TTVX - Flatcars equipped with Vert-A-Pak superstructure, furnished by participant railroads.

TTX - Flatcars equipped with hitches and bridgeplates for transporting trailers. See Note 1.

XTTX - Flatcars equipped with four hitches and bridgeplates for transporting two trailers, one 45-ft and one 40-ft, or three 28-ft trailers.

ZTTX - Flatcars equipped with 30 stake pockets, 15 per side, for transporting long poles.

Note 1 - TTX 105-109 are specially equipped, multihitch instruction cars, not suitable for revenue service. For disposition or further information on these cars, contact Mr. M. B. Flagg, Manager, Inspection and Training, Trailer Train Company, 300 So. Wacker Dr., Chicago, IL 60606.

although these cars can save blocking and bracing and should be requested when they can be employed profitably in a specific move, the likelihood of obtaining the cars is too weak to base outloading requirement on their use.

Factors affecting the use of specialized flatcars include:

1. First priority for use of general-purpose flats should be to load tracked vehicles and nonstandard wheeled vehicles; for example, artillery.

2. First priority for requesting specialized flats should be for TOFC and COFC cars to load vans and containers, which require very extensive blocking and bracing to move on general-purpose cars.

3. TOFC and COFC cars require no blocking and bracing.

4. Bilevel and trilevel flats will require heavier chains and possibly different hooks to handle other than commercial specification vehicles. Due to the problem of close clearance on trilevel cars, emphasis on vehicle outloading should be placed on bilevel and flatcars.

5. Chain tiedown flats may require heavier chains, depending on the loads for which they were designed.

6. Where TOFC cars must be loaded using a ramp rather than side or overhead loading, the number of cars at a ramp should be limited to about 10 because of the delay involved in backing the trailers down the length of the cars and returning with the tractor.

7. Where sufficient suitable aprons and MHE are available, it may be desirable to load containers directly onto COFC cars rather than to place them on bogies and use TOFC cars.

8. If COFC or TOFC cars are not available, some blocking and bracing time and expense can be saved by using bulkhead flatcars to carry containers.

9. Bilevel and trilevel cars require, obviously, bilevel and trilevel ramps or other equipment as indicated in TM 55-625.

10. TOFC, COFC, bilevel, and trilevel cars average 89 feet long. TOFC cars can handle two 40-foot trailers or one 40-foot and one 45-foot trailer. COFC cars can handle four 20-foot container

equivalents. Autorack cars can accommodate four to seven vehicles per deck, depending on vehicle length and the number of tiedown chain sets.

11. Tracks used to store or load cars over 65 feet long should be reachable without going through curves exceeding 10-degree curvature, and tracks used for cars between 55 and 65 feet should be reachable without going through curves exceeding 12-degree curvature.

APPENDIX D

FRA REPORT

E. R. Hassel
Director of Railroad Safety June 20, 1979

R. A. Bergeron
Track Safety Inspector

Inspection of Track Facilities,
United States Army, Fort Devens,
Ayer, Massachusetts

On June 18, 1979, I met with Norman MacLeod, representing the Military Traffic Management Command and Richard Coward, representing the Transportation Department of Fort Devens at Ayer, Massachusetts.

I asked Mr. MacLeod what type of inspections he required, and he explained that he wanted a generalization of the track conditions in the five miles of track in the Fort. I made out a checklist type format, we walked about a mile of track and he was satisfied with the information on the checklist.

On Tuesday, June 19, 1979, accompanied by Mr. MacLeod and Mr. Coward, we walked the remaining four miles of track.

The Fort Devens yards are served by the Boston and Maine Corporation on the Worcester Route Main Line at Ayer, Massachusetts by two switches, one off the Hill Yard lead and one off the Westward Main Line to the Commissary tracks and the National Guard tracks.

At the conclusion of my inspection, I found various areas that does not meet FRA Class 1 Track Safety Standards, as my checklist format will document. Included are, crossties on certain tracks, switch timbers, broken rails, line kinks, caused by equipment hitting the tracks, wide gage in grade crossings, caused by snow plows striking the rail. There are a variety of rails from 105-35, 80, 75 and smaller. The 75 pound rail and smaller had no tie plates, which makes it detrimental to lateral forces of rail roll over, caused by heavy loads and locomotives of today.

The attachments are yard prints and the checklist format used in the inspection.

Attachments

R. A. Bergeron
Track Safety Inspector

cc: R. Corward-Fort Devens
Norman J. MacLeod-MTMC

From B&M RR Switch Hill Yard Lead to Coleman & Salvage Tracks

Track	Crossties	Rails	Joints	Surface & Line	Gage	Remarks
Lead From B&M & Coleman I	340 ft - 100' bad ties	1 broken rail	OK	Poor	✓	All crossties plus broken rail - bad
Switch to Coleman I	90 bad timber	OK				Frog & switch pts ok
Coleman I	20 bad ties curve	OK			58"	In crossing
Switch to Coleman II	50 bad timbers	OK				Frog & switch pts ok
Coleman II	25 bad ties			Poor in curve		Track needs drainage
Lead to Tracks 1-2-3-4	20 bad ties	OK				
Switch to Track I	OK	No tie plates 80 lb rail	OK			Guard rail out of adjust-ment, no tie plates
Track I	25 bad ties	80 lb	OK			No tie plates
Switch to Track II	50 bad timber	85 lb	OK			
Track II	25 bad ties	85 lb-75 lb 56 lb	OK	Line kink & rail	OK	Line kink hit by snow plow
Switch to Track III	50 bad timbers	OK				
Track III	50 bad ties	OK				No tie plates 75 lb rail rolled out bunter end
Switch to Track IV	OK	OK		X level needs tamping	OK	
Track IV	10 bad ties	OK	OK		1"	1" wide gage kink bent by snow plows
Switch to Salvage track	75 bad timbers	OK				Frog & switch pts ok
Salvage track	80 bad ties	1 broken 1 bent	1 cracked	OK	OK	A lot of gage rods in curve because bad ties
Switch to coal storage	100 bad timbers	OK				
Coal Storage	50 bad ties	OK				Track 150 ft long
Switch to cold storage	100 bad timbers	OK				
Cold storage	OK					50' filled in - hot top to cold storage building

C
O
P
Y

II

From B&M RR Westward Track to Commissary and National Guard

Track	Crossties	Rails	Joints	Surface & Line	Gage	Remarks
Radius from B&M RR to Track 5 to runaround	50 bad ties	75 and 85 lb rail (OK)	OK		59"	Grade crossing before commissary building
Track at Bldg T3772	50 bad ties	OK				200 ft long not top in places
Switches to runaround	50 bad timbers	OK				
Switch to Track 6	OK					
Track 6	20 bad ties				58-1/4	In grade [illegible]
NATIONAL GUARD TRACKS [illegible]						
Switch to Track 5	[illegible] bad timber	85 lb	OK			[illegible] tie plates [illegible]
Track 5	[illegible] bad ties	75 lb	OK			[illegible] rail [illegible] center, no tie plates
Switch to Track 4	OK	85 lb	OK			Need tie plates & switch plates
Track 4	[illegible] bad ties	75 lb	OK	[illegible] spots line kinked	OK	4 line kinks caused [illegible] snow plow striking [illegible] tie plates
Switch to Track 3	10 bad timbers	75 lb	OK			No plates or switch plates
Track 3	20 bad ties	4 kinked rails 75 lb	OK	Line Bunter end		(4) kinked rails
Switch to Track 2	OK	75 lb	OK			No tie plates or switch plates
Track 2	OK	75 lb	OK			No tie plates
Switch to Track 1	30 bad timber	85 lb	OK			No tie plates or switch plates
Track 1	10 bad ties	75 lb HSH rail			55"	No tie plates Gage 1-spot

/s/R. A. BERGERON
6/20/79
Track Safety Inspector

DISTRIBUTION

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Fort Devens, MA 01433 (2)

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DATE

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